DOCUMENT RESUME

ED 355 248 TM 019 585

AUTHOR	Beaton, Albert E.; And Others
TITLE	Expanding the New Design: The NAEP 1985-86 Technical Report.
INSTITUTION	Educational Testing Service, Princeton, N.J.; National Assessment of Educational Progress, Princeton, NJ.; Westat, Inc., Rockville, MD.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO	ISBN-0-88685-086-X; NAEP-17-TR-20
PUB DATE	Nov 88
CONTRACT	NIE-G-83-0011
NOTE	672p.
AVAILABLE FROM	National Assessment of Educational Progress at Educational Testing Service, Rosedale Road, Princeton, NJ 08541.
PUB TYPE	Collected Works - General (020) -- Statistical Data (110) -- Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF03/PC27 Plus Postage.
DESCRIPTORS	*Databases: *Data Collection; Data Processing; Field Tests; Grade 8; Junior High Schools; *Junior High School Students; National Surveys; *Research Design; Research Methodology; *Sampling; Scaling; Scoring; Student Characteristics; Student Evaluation; *Tables (Data); Test Items; Test Results
IDENTIFIERS	*National Assessment of Educational Progress

ABSTRACT

This report supplies details of the design and data analysis of the 1986 National Assessment of Educational Progress (NAEP) to allow the reader to judge the utility of the design, data quality, reasonableness of assumptions, appropriateness of data analyses, and generalizability of inferences made from the data. After an introduction by A. E. Beaton, the following reports are included: (1) "Overview of Part I: The Design and Implementation of the 1986 NAEP" (A. E. Beaton); (2) "Developing the 1986 National Assessment Objectives, Items, and Background Questions" (I. V. S. Mullis, W. MacDonald, and N. A. Mead); (3) "Sample Design" (M. H. Hansen, K. Rust, and J. Burke); (4) "Instrument and Item Information" (J. R. Johnson); (5) "Field Administration" (N. Caldwell and R. Slobasky); (6) "Materials Processing and Database Creation" (J. L. Barone); (7) "Processing Assessment Materials" (A. M. Rogers and N. A. Norris); (8) "Professional Scoring" (A. Campbell); (9) "Data Transcription Systems" (A. M. Rogers); (10) "Editing Data" (A. M. Rogers); (11) "Quality Control of Data Entry" (J. J. Ferris); (12) "Database Creation" (A. M. Rogers); (13) "Public-Use Data Tape Construction" (A. M. Rogers); (14) "Overview of Part II: The Analysis of the 1986 NAEP" (A. E. Beaton); (15) "Scaling Procedures" (R. J. Mislevy); (16) "Reading Data Analysis" (R. Zwick); (17) "Mathematics Data Analysis" (E. G. Johnson); (18) "Science Data Analysis" (K. Yamamoto); (19) "Computer Competence Data Analysis" (N. A. Mead); (20) "History and Literature Data Analysis" (R. Zwick); (21) "Weighting Procedures and Variance Estimation" (E. G. Johnson, J. Burke, J. Braden, M. H. Hansen, J. A. Lago, and B. J. Tepping); and (22) "Statistical Summary of the 1986 NAEP Sample and Estimates of the Proficiencies of American Students" (A. E. Beaton, D. S. Freund, B. A. Kaplan, and M. A. Narcowich). A total of 169 tables and 8 figures illustrate the text. Six appendixes with 116 additional tables provide supplemental information about the research methodology. (Contains 60 references.) (SLD)

THE NATION'S REPORT CARD

naep

Expanding the New Design

The NAEP 1985-86 Technical Report

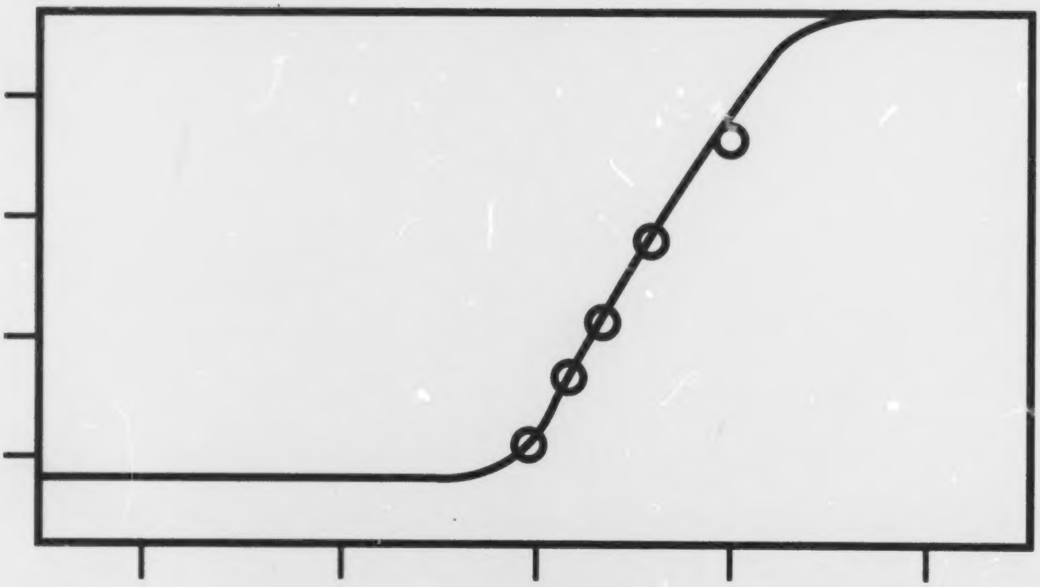
U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

ED355248



ETS

EDUCATIONAL TESTING SERVICE

BEST COPY AVAILABLE

TM019585

The National Assessment of Educational Progress is funded by the U.S. Department of Education under a grant to Educational Testing Service. National Assessment is an education research project mandated by Congress to collect data over time on the performance of young Americans in various subject areas. It makes available information on assessment procedures to state and local education agencies.

The Foundations of Literacy Project is funded by the National Endowment for the Humanities under a grant to the Educational Excellence Network, Columbia University. The Educational Excellence Network subcontracted the assessment of 17-year-old and 11th grade students' knowledge of history and literature to NAEP.

This report, No. 17-TR-20, can be ordered from the National Assessment of Educational Progress at Educational Testing Service, Rosedale Road, Princeton, New Jersey 08541.

Library of Congress Catalog Card Number 88-63274

ISBN 0-88685-086-X

This document is based upon work performed pursuant to Grant No. NIE-G-83-0011 of the Office for Educational Research and Improvement, Center for Education Statistics. It does not, however, necessarily reflect the views of that agency.

Educational Testing Service is an equal opportunity/affirmative action employer.

Educational Testing Service, ETS, and ETS are registered trademarks of Educational Testing Service.

THE NATION'S
REPORT CARD
naep

Expanding the New Design

The NAEP 1985-86 Technical Report

Albert E. Beaton

in collaboration with

John L. Barone, Anne Campbell, John J. Ferris, David S. Freund,
Eugene G. Johnson, Janet R. Johnson, Bruce A. Kaplan, Debra L. Kline,
Walter MacDonald, Nancy A. Mead, Robert J. Mislevy, Ina V.S. Mullis,
Michael A. Narcowich, Norma A. Norris, Alfred M. Rogers,
Kathleen M. Sheehan, Kentaro Yamamoto, Rebecca Zwick

Educational Testing Service • Princeton, NJ

and

Jill Braden, John Burke, Nancy Caldwell, Morris H. Hansen,
Josefina A. Lago, Keith Rust, Renee Slobasky, Benjamin J. Tepping

Westat, Inc. • Washington, DC

November 1988

EXPANDING THE NEW DESIGN:
THE NAEP 1985-86 TECHNICAL REPORT

CONTENTS

Index of Tables and Figures v
Acknowledgments xi

Introduction 3
Albert E. Beaton

PART I

Chapter 1 Overview of Part I: The Design and Implementation of the 1986 NAEP 19
Albert E. Beaton

Chapter 2 Developing the 1986 National Assessment Objectives, Items, and Background Questions 37
Ina V. S. Mullis, Walter MacDonald, Nancy A. Mead

Chapter 3 Sample Design 67
Morris H. Hansen, Keith Rust, John Burke

Chapter 4 Instrument and Item Information 77
Janet R. Johnson

Chapter 5 Field Administration 85
Nancy Caldwell, Renee Slobasky

Chapter 6 Materials Processing and Database Creation 91
John L. Barone

Chapter 6.1 Processing Assessment Materials 99
Alfred M. Rogers, Norma A. Norris

Chapter 6.2 Professional Scoring 115
Anne Campbell

Chapter 6.3 Data Transcription Systems 125
Alfred M. Rogers

Chapter 6.4 Editing Data 137
Alfred M. Rogers

Chapter 6.5 Quality Control of Data Entry 143
John J. Ferris

Chapter 6.6 Database Creation 151
Alfred M. Rogers

Chapter 6.7 Public-use Data Tape Construction 157
Alfred M. Rogers

PART II

Chapter 7 Overview of Part II: The Analysis of the 1986 NAEP 169
Albert E. Beaton

Chapter 8 Scaling Procedures 177
Robert J. Mislevy

Chapter 9 Reading Data Analysis 207
Rebecca Zwick

Chapter 10 Mathematics Data Analysis 215
Eugene G. Johnson

Chapter 11 Science Data Analysis 243
Kentaro Yamamoto

Chapter 12 Computer Competence Data Analysis 259
Nancy A. Mead

Chapter 13 History and Literature Data Analysis 265
Rebecca Zwick

Chapter 14 Weighting Procedures and Variance Estimation 273
Eugene G. Johnson, John Burke, Jill Braden, Morris H. Hansen, Josefina A. Lago, Benjamin J. Tepping

PART III

Chapter 15 Statistical Summary of the 1986 NAEP and Estimates of the Proficiency of American Students 297
Albert E. Beaton, David S. Freund, Bruce A. Kaplan, Michael A. Narcowich

Appendix A: Instrument and Item Tables 421

Appendix B: Conditioning Variables Tables 461

Appendix C: WARM Variables Tables 523
Bruce A. Kaplan

Appendix D: The IRT Linking Procedures Used to Place the 1986 Intermediary Scaling Results onto the 1984 Reading Calibration Scale 555
Kathleen M. Sheehan

Appendix E: IRT Item Parameter Tables 569

Appendix F: U. S. History and Literature Items 615

References 625

EXPANDING THE NEW DESIGN: THE NAEP 1985-86 TECHNICAL REPORT

Index of Tables and Figures

Table 1.1 Assessment schedule 21
1.2 The 1986 NAEP samples 24

3.1 The sampling subuniverses and the number of noncertainty strata in each 69
3.2 Grade definition of school eligibility for frame inclusion 70
3.3 School sample sizes, refusals, and substitutes 71
3.4 Participation and exclusion rates by age class 73

4.1 Number of subject area blocks administered 78
4.2 Bridge A booklet configuration 78
4.3 Bridge B booklet configuration 79
4.4 Subjects taught by 1986 teacher sample 80

5.1 Comparison of 1986 and 1984 student participation rates 87

Figure 6.1 Data flow overview 93

6.1.1 Data entry system main menu 102
6.1.2 School worksheet entry screen #1 103
6.1.3 School worksheet entry screen #2 103
6.1.4 Student session data entry screen 108
6.1.5 Student booklet cover data entry screen 109
6.1.6 Questionnaire data entry screen 111

Table 6.2.1 Distribution of open-ended reading, science, and computer competence items 116
6.2.2 Percentages of exact score point agreement and intraclass correlation coefficients for 1986 open-ended reading, science, and computer competence items 121
6.2.3 Reliability statistics for scoring of open-ended items 122

Figure 6.3.1 Intelligent data entry system 126

Table 6.5.1 Observed error rate and upper confidence limit 147

8.1 Proportions of proficiency variance accounted for 193
8.2 Estimation error variances and related coefficients for the 1986 grade-level reading assessments 195
8.3 Number of WARM composite variables by subject and grade/age 196
8.4 Variables conditioned on for 1986 by grade/age 197
8.5 Contrast codings for 1986 conditioning variables 198

Table 9.1 Reading scale item information, by sample 207
9.2 Dichotomization rules for open-ended reading items used in scaling 208
9.3 Reading item scores excluded from IRT scale 209
9.4 Students included in BILOG run, by sample 210

10.1 Distribution of the members of items by booklet within each of the mathematics content areas, grade 3/age 9 218
10.2 Distribution of the members of items by booklet within each of the mathematics content areas, grade 7/age 13 219
10.3 Distribution of the members of items by booklet within each of the mathematics content areas, grade 11/age 17 220
10.4 Mathematics items deleted for specified populations because of differential functioning 223
10.5 Number of items by subscale and percent not reached 224
10.6 Mathematics items deleted for percent nonresponse ≥ 45 225
10.7 Number of mathematics items scaled, by subscale and grade/age 226
10.8 Comparison of the subscale means and standard deviations based on the multivariate plausible values with the univariate BILOG results 227
10.9 Estimated correlations between subscales 231
10.10 Defining weights for the mathematics composite 232
10.11 Coefficients of the linear transformations of the subscales from their original units to the units of the composite 232
10.12 Comparison by grade and demographic subgroup of the mathematics composite mean with the mean of the three age-spanning subscales 234
10.13 Student sample sizes for mathematics trend scaling 236
10.14 Samples of students used in the scaling for trend 237
10.15 Counts of mathematics trend items by age, year, and content area 239
10.16 Coefficients of the linear transformation of the trend scale from original units to units of the composite 239

11.1 Science scale information, by sample 243
11.2 Identification of science subscales and number of items used for analysis 246
11.3 Science items dropped for specified populations because of lack of fit to IRT 246
11.4 Comparison of the subscale means and standard deviations based on the multivariate plausible values with the univariate BILOG results 248
11.5 Defining weights for the science composite by grade/age 249
11.6 Coefficients of the linear transformations of the subscales from the calibrating scale to the units of the reporting proficiency scale 250
11.7 Samples of students used in scaling for trend 253
11.8 Number of items in common across the three ages 253
11.9 Coefficients of the linear transformation of the trend scale from the calibration units to the units of the composite 254

13.1 NAEP history and literature assessment, descriptive statistics 266
13.2 Results of MINRES factor analyses of guessing-corrected tetrachoric matrices of NAEP items 268

Table 14.1 Major subgroups for poststratification 281
14.2 Distribution of design effects by demographic subgroup for the cognitive reading items given in 1986, grade 3 288
14.3 Distribution of design effects by demographic subgroup for the cognitive reading items given in 1986, grade 7 289
14.4 Distribution of design effects by demographic subgroup for the cognitive reading items given in 1986, grade 11 290

15.1 Measurement instruments developed for 1986 NAEP 303
15.2 Number of items administered 304
15.3 Number of cognitive items by type of administration 305
15.4 Characteristics of schools in main NAEP (spiral) sample 306
15.5 Number of responses to teacher questionnaire 308
15.6 Number of assessment sessions by type of administration 309
15.7 Number of students assessed and excluded by type of administration 310
15.8 Number of students in the main NAEP sample, grade 3/age 9 311
15.9 Number of students in the main NAEP sample, grade 7/age 13 312
15.10 Number of students in the main NAEP sample, grade 11/age 17 313
15.11 Number of students in the bridge A sample 314
15.12 Number of students in the bridge B sample 315
15.13 Excluded student sample by demographic characteristics, grade 3/age 9 316
15.14 Excluded student sample by demographic characteristics, grade 7/age 13 317
15.15 Excluded student sample by demographic characteristics, grade 11/age 17 318
15.16 Number of students by grade/age and type of assessment 319
15.17 Number of spiral students, grade 3/age 9 320
15.18 Number of spiral students, grade 7/age 13 321
15.19 Number of spiral students, grade 11/age 17 322
15.20 Number of bridge students, age 9 323
15.21 Number of bridge students, age 13 324
15.22 Number of bridge students, age 17 325
15.23 Estimated total of students in the population eligible for spiral assessment, grade 3/age 9, weighted 326
15.24 Estimated total of students in the population eligible for spiral assessment, grade 7/age 13, weighted 327
15.25 Estimated total of students in the population eligible for spiral assessment, grade 11/age 17, weighted 328
15.26 Estimated total of students eligible for assessment by bridge sample, age 9, weighted 329
15.27 Estimated total of students eligible for assessment by bridge sample, age 13, weighted 330
15.28 Estimated total of students eligible for assessment by bridge sample, age 17, weighted 331
15.29 Estimated total population of excluded students, grade 3/age 9, weighted 332
15.30 Estimated total population of excluded students, grade 7/age 13, weighted 333
15.31 Estimated total population of excluded students, grade 11/age 17, weighted 334
15.32 Spiral sample students with reading scale scores, grade 3/age 9 335
15.33 Spiral sample students with reading scale scores, grade 7/age 13 336
15.34 Spiral sample students with reading scale scores, grade 11/age 17 337
15.35 Spiral sample students with mathematics scale scores, grade 3/age 9 338

Table 15.36 Spiral sample students with mathematics scale scores, grade 7/age 13 339
15.37 Spiral sample students with mathematics scale scores, grade 11/age 17 340
15.38 Spiral sample students with science scale scores, grade 3/age 9 341
15.39 Spiral sample students with science scale scores, grade 7/age 13 342
15.40 Spiral sample students with science scale scores, grade 11/age 17 343
15.41 Spiral sample students with history scale scores, grade 11/age 17 344
15.42 Spiral sample students with literature scale scores, grade 11/age 17 345
15.43 Weighted means, standard deviations, and percentiles for reporting groups, reading, grade 3 346
15.44 Weighted means, standard deviations, and percentiles for reporting groups, mathematics, grade 3 347
15.45 Weighted means, standard deviations, and percentiles for reporting groups, science, grade 3 348
15.46 Weighted means, standard deviations, and percentiles for reporting groups, reading, grade 7 349
15.47 Weighted means, standard deviations, and percentiles for reporting groups, mathematics, grade 7 350
15.48 Weighted means, standard deviations, and percentiles for reporting groups, science, grade 7 351
15.49 Weighted means, standard deviations, and percentiles for reporting groups, reading, grade 11 352
15.50 Weighted means, standard deviations, and percentiles for reporting groups, mathematics, grade 11 353
15.51 Weighted means, standard deviations, and percentiles for reporting groups, science, grade 11 354
15.52 Weighted response percentages and general reading proficiency means, grade 3, total sample 355
15.53 Weighted response percentages and general reading proficiency means, grade 3, by sex of subject 356
15.54 Weighted response percentages and general reading proficiency means, grade 3, by region of country 357
15.55 Weighted response percentages and general reading proficiency means, grade 3, by derived race 358
15.56 Weighted response percentages and general reading proficiency means, grade 3, by level of parents' education 359
15.57 Weighted response percentages and general reading proficiency means, grade 3, by articles in the home 360
15.58 Weighted response percentages and general reading proficiency means, grade 3, by television viewing 361
15.59 Weighted response percentages and general mathematics proficiency means, grade 3, total sample 362
15.60 Weighted response percentages and general mathematics proficiency means, grade 3, by sex of subject 363
15.61 Weighted response percentages and general mathematics proficiency means, grade 3, by region of country 364
15.62 Weighted response percentages and general mathematics proficiency means, grade 3, by derived race 365
15.63 Weighted response percentages and general mathematics proficiency means, grade 3, by level of parents' education 366
15.64 Weighted response percentages and general mathematics proficiency means, grade 3, by articles in the home 367
15.65 Weighted response percentages and general mathematics proficiency means, grade 3, by television viewing 368
15.66 Weighted response percentages and general science proficiency means, grade 3, total sample 369

Table 15.67 Weighted response percentages and general science proficiency means, grade 3, by sex of subject 370
15.68 Weighted response percentages and general science proficiency means, grade 3, by region of country 371
15.69 Weighted response percentages and general science proficiency means, grade 3, by derived race 372
15.70 Weighted response percentages and general science proficiency means, grade 3, by level of parents' education 373
15.71 Weighted response percentages and general science proficiency means, grade 3, by articles in the home 374
15.72 Weighted response percentages and general science proficiency means, grade 3, by television viewing 375
15.73 Weighted response percentages and general reading proficiency means, grade 7, total sample 376
15.74 Weighted response percentages and general reading proficiency means, grade 7, by sex of subject 377
15.75 Weighted response percentages and general reading proficiency means, grade 7, by region of country 378
15.76 Weighted response percentages and general reading proficiency means, grade 7, by derived race 379
15.77 Weighted response percentages and general reading proficiency means, grade 7, by level of parents' education 380
15.78 Weighted response percentages and general reading proficiency means, grade 7, by articles in the home 381
15.79 Weighted response percentages and general reading proficiency means, grade 7, by television viewing 382
15.80 Weighted response percentages and general mathematics proficiency means, grade 7, total sample 383
15.81 Weighted response percentages and general mathematics proficiency means, grade 7, by sex of subject 384
15.82 Weighted response percentages and general mathematics proficiency means, grade 7, by region of country 385
15.83 Weighted response percentages and general mathematics proficiency means, grade 7, by derived race 386
15.84 Weighted response percentages and general mathematics proficiency means, grade 7, by level of parents' education 387
15.85 Weighted response percentages and general mathematics proficiency means, grade 7, by articles in the home 388
15.86 Weighted response percentages and general mathematics proficiency means, grade 7, by television viewing 389
15.87 Weighted response percentages and general science proficiency means, grade 7, total sample 390
15.88 Weighted response percentages and general science proficiency means, grade 7, by sex of subject 391
15.89 Weighted response percentages and general science proficiency means, grade 7, by region of country 392
15.90 Weighted response percentages and general science proficiency means, grade 7, by derived race 393
15.91 Weighted response percentages and general science proficiency means, grade 7, by level of parents' education 394
15.92 Weighted response percentages and general science proficiency means, grade 7, by articles in the home 395
15.93 Weighted response percentages and general science proficiency means, grade 7, by television viewing 396

Table 15.94 Weighted response percentages and general reading proficiency means, grade 11, total sample 397
15.95 Weighted response percentages and general reading proficiency means, grade 11, by sex of subject 398
15.96 Weighted response percentages and general reading proficiency means, grade 11, by region of country 399
15.97 Weighted response percentages and general reading proficiency means, grade 11, by derived race 400
15.98 Weighted response percentages and general reading proficiency means, grade 11, by level of parents' education 401
15.99 Weighted response percentages and general reading proficiency means, grade 11, by articles in the home 402
15.100 Weighted response percentages and general reading proficiency means, grade 11, by television viewing 403
15.101 Weighted response percentages and general mathematics proficiency means, grade 11, total sample 404
15.102 Weighted response percentages and general mathematics proficiency means, grade 11, by sex of subject 405
15.103 Weighted response percentages and general mathematics proficiency means, grade 11, by region of country 406
15.104 Weighted response percentages and general mathematics proficiency means, grade 11, by derived race 407
15.105 Weighted response percentages and general mathematics proficiency means, grade 11, by level of parents' education 408
15.106 Weighted response percentages and general mathematics proficiency means, grade 11, by articles in the home 409
15.107 Weighted response percentages and general mathematics proficiency means, grade 11, by television viewing 410
15.108 Weighted response percentages and general science proficiency means, grade 11, total sample 411
15.109 Weighted response percentages and general science proficiency means, grade 11, by sex of subject 412
15.110 Weighted response percentages and general science proficiency means, grade 11, by region of country 413
15.111 Weighted response percentages and general science proficiency means, grade 11, by derived race 414
15.112 Weighted response percentages and general science proficiency means, grade 11, by level of parents' education 415
15.113 Weighted response percentages and general science proficiency means, grade 11, by articles in the home 416
15.114 Weighted response percentages and general science proficiency means, grade 11, by television viewing 417

ACKNOWLEDGMENTS

This report, as well as the data and analyses that it documents, is the result of the contributions of many persons at ETS, Westat, and elsewhere. It is fitting that these individuals be acknowledged for their contributions to NAEP.

NAEP is funded through the Office for Educational Research and Improvement (OERI) of the Department of Education. The staff of OERI have worked in cooperation with the ETS staff in many ways and have played an important role in helping NAEP fulfill its function. I wish to take this opportunity to thank Emerson Elliott, David Sweet, Gary Phillips, and Gene Owen, who have all been particularly helpful.

The ETS and NAEP management staffs have also been very supportive of the technical work of NAEP. Special thanks go to Greg Anrig, Bob Solomon, Vic Bunderson, and Henry Braun of ETS management and to Archie Lapointe, Ina Mullis, Paul Barton, Jules Goodison, and Doug Rhodes of NAEP management.

Ina Mullis deserves special note for her major influence on our evolving concept of NAEP, from its design through instrument development to the interpretation of results.

Nancy Mead and Norma Norris were primarily responsible for the operational aspects of the 1986 NAEP.

Kent Ashworth and Janice Askew have been particularly helpful in the design and production of this and other reports.

The NAEP Design and Analysis Committee, which oversees the technical aspects of NAEP, has been outstanding. The members are Robert Linn (Chair), John B. Carroll, Bert Green, Robert Glaser, Sylvia Johnson, Ingram Olkin, Tej Pandey, Richard Snow, and John Tukey.

* * *

The design and the data analysis of the 1986 NAEP, including the writing of this report, was largely the function of the NAEP data analysis staff. The staff members have made many creative contributions to the statistical and psychometric aspects of the assessment as well as managing the day-to-day data analytic operations. I am particularly indebted for the major contributions of Janet Johnson, Gene Johnson, Maxine Kingston, Bob Mislevy, Peter Pashley, Kathy Sheehan, Kentaro Yamamoto, and Rebecca Zwick, and for the assistance of Jo-Ling Liang.

The Data Analysis Department, under the extraordinary direction of John Barone, was responsible for developing the operating systems and producing the data analyses. Developing and operating the NAEP data management systems under severe time constraints were the province of Al Rogers and Norma Norris. Other members of this group who made substantial contributions of their talent and important contributions to the NAEP data analyses were Laurie Barnett, Jim Ferris, Dave Freund, Doug Gentile, Tom Jirele, Bruce Kaplan, Ed Kulick, Laura McCamley, Mike Narcowich, Jennifer Nelson, Kate Pashley, Ira Sample, and Minhwei Wang. Although all of these persons made important

contributions, I would be remiss not to single out the extraordinary work of Norma Norris, Al Rogers, Dave Freund, Bruce Kaplan, and Ed Kulick.

Westat, Inc. has also contributed its wealth of wisdom and experience to the design and implementation of NAEP, including this report. Morris Hansen supervised the NAEP sampling and Renee Slobasky the field operations. I am also grateful to Jill Braden, John Burke, Nancy Caldwell, Morris Hansen, Josefina Lago, Keith Rust, and Ben Tepping.

Without an able secretarial staff, this report would have been impossible. I wish to thank Sharon Stewart, Mary Varone, and Marcy Yates for their hard work and dedication.

Other ETS staff members made important contributions to the design, development, and implementation of NAEP. These include Joan Baratz, Anne Campbell, Kalle Gerritz, Peg Goertz, Ann Jungeblut, Walt MacDonald, Andy Mychajlowycz, and Gita Wilder.

Thanks also go to Pete Simonelli, Pete Stremic, and their respective staffs, who were responsible for the printing of the report in its various drafts as well as in final form; and to Joe Belica, who designed the cover.

Special acknowledgment and thanks are due to the 25 collaborating authors of this report. I would also like to thank Paul Barton, Henry Braun, Archie Lapointe, and Ina Mullis for their helpful reviews.

Finally, special thanks are due to the outstanding work of Debbie Kline, the editor of this report, who was responsible for the report's writing schedule, its editing, supervising its production, and assuring its cohesiveness.

Albert E. Beaton
Director of Data Analysis
National Assessment of
Educational Progress
November 1, 1988

INTRODUCTION

EXPANDING THE NEW DESIGN:
THE NAEP 1985-86 TECHNICAL REPORT

INTRODUCTION

Albert E. Beaton

Educational Testing Service

The 1986[1] National Assessment of Educational Progress (NAEP) surveyed what students knew and could do in the subject areas of reading, mathematics, science, computer competence, and, for older students only, U.S. history and literature. The populations that were sampled included American public and private school students of ages 9, 13, and 17 as well as those in 3rd, 7th, and 11th grades.

This technical report is intended to supply the details of the design and data analysis of the 1986 assessment. Our aim is to give the reader sufficient information to judge the utility of the design, the quality of the NAEP data, the reasonableness of the assumptions made, the appropriateness of the data analyses, and the generalizability of the inferences made from the data. This report covers only the technical aspects of the 1986 NAEP. It does not attempt to provide the substantive results that might be of interest to educational policymakers; such results are provided in the NAEP cross-sectional and trend reports on student achievement in the various subject areas. This technical documentation is intended to support the proficiency reports by presenting detailed information about the data and analyses that were interpreted and presented in the reports. Analyses performed specifically for the achievement reports are discussed in the procedural appendices of those reports.

The NAEP staff, of course, did not do this work alone. It had the policy guidance of the Assessment Policy Committee (APC), chaired by Senator Pat Frank of Florida. It is also important to recognize the many thoughtful discussions, recommendations, reviews, comments, and other substantial help on technical issues that the NAEP staff received from the highly accomplished members of its Design and Analysis Committee (formerly the Technical Advisory Committee) chaired by Professor Robert Linn (University of Colorado). Other members of this committee are Professor John B. Carroll (University of North Carolina), Professor Robert Glaser (University of Pittsburgh), Professor Bert Green (Johns Hopkins University), Professor Sylvia Johnson (Howard University), Professor Ingram Olkin (Stanford University), Dr. Tej Pandey (California Department of Education), Professor Richard Snow (Stanford University), and Professor John W. Tukey (Princeton University).

---

[1] Throughout this report, the assessments conducted during the 1983-84 and 1985-86 school years will be referred to respectively as the 1984 and 1986 assessments.

This technical report is organized into three parts:

Part I begins with Chapter 1, which contains a discussion of the NAEP 1986 design and a summary of the steps followed in the process of developing the basic data. This chapter is followed by chapters covering the development of the items in the subject areas that were assessed; the sampling; the measurement instruments; the field administration (including attainment of school cooperation); and the data entry, item scoring, and construction of the NAEP database and public-use data tapes. Quality control is covered throughout Part I.

Part II explains the steps involved in data analysis. Chapter 7, the first chapter in this part, begins with an overview of the aims of the data analysis and a summary of the procedures. Chapter 8 contains an overview of the scaling procedures used in NAEP and recommended analytic procedures. Subsequent chapters describe the application of the data analytic procedures in reading, mathematics, science, computer competence, and history and literature. The final chapter in Part II discusses the sampling weights and variance estimation.

Part III presents some basic data from the 1986 NAEP, including the properties of the measuring instruments, characteristics of the selected sample, and some estimates of the proficiency of the students in American schools. Only a few of the huge number of possible population proficiency estimates are presented, and these include estimates of the means, standard deviations, and selected percentiles of populations of students in various subject areas at various grade levels. Population estimates are also reported separately by gender, racial/ethnic grouping, and other subpopulations. Estimates of the average values for cross-classifications of several important variables are also reported. Estimated standard errors are provided with all parameter estimates.

The rest of this introduction contains general background information about NAEP and comment on the rationale for some of the modifications that have been implemented in design and analysis. The section gives the legislative mandate under which this assessment was conducted. Subsequent sections briefly describe the changes in the design of NAEP in the 1986 assessment, the steps in implementing NAEP, important changes in analytic procedures, the effect of the several changes on the National Assessment, the rationale for the public-use data tapes, and the organization strategy of this report.

CONGRESSIONAL MANDATE FOR NAEP

The National Assessment of Educational Progress is a continuing, congressionally mandated, national survey of educational achievement. The

Congressional Act (Public Law 95-561-Nov. 1, 1978) under which the NAEP grant, including the 1986 assessment, was offered stated that

> "[NAEP]...shall have as a primary purpose the assessment of performance of children and young adults in the basic skills of reading, mathematics, and communication. Such a National Assessment shall...
>
> (A) collect and report at least once every five years data assessing the performance of students at various age or grade levels in each of the areas of reading, writing, and mathematics;
>
> (B) report periodically data on changes in knowledge and skills of such students over a period of time;
>
> (C) conduct special assessments of other educational areas, as the need for additional information arises; and
>
> (D) provide technical assistance to State educational agencies and to local educational agencies on the use of the National Assessment objectives, primarily pertaining to the basic skills of reading, mathematics, and communication, and on making comparisons of such assessments with the national profile and change data developed by the National Assessment."

In addition to fulfilling this Congressional mandate, NAEP also gathered ancillary data that can be of use in interpreting the basic findings about the knowledge and skills of young Americans. It is the first ongoing effort to obtain comprehensive and dependable achievement data on a national basis in a uniform, scientific manner. NAEP was originally designed in the 1960s and collected its first data in 1969. The NAEP grant was administered by the Education Commission of the States (ECS) until 1983 when the grant was moved to Educational Testing Service (ETS). Since its inception, NAEP has collected information not only on reading, writing, and mathematics, as required by the 1978 law, but also on a number of other subject areas such as science, citizenship, art, and music.

In 1982, ETS proposed a new, comprehensive design for NAEP. The design was described extensively in The Conduct of the National Assessment of Educational Progress, a Proposal in Response to RFP PA-82-001, submitted by ETS to the National Institute of Education, November 17, 1982. An overview of the design was published in the report A New Design for A New Era (Messick, Beaton, & Lord, 1983). Five years have passed since ETS received the grant to implement its design for NAEP; the concepts in the proposed design have now been put into practice, the students have been assessed, the resulting data have been analyzed, and reports have been published, including a previous technical report, Implementing the New Design: The NAEP 1983-84 Technical Report (Beaton, 1987a).

It should be noted that the Congressional mandate for NAEP has been modified and broadened to augment the design of the 1990 and ensuing assessments by introducing summary proficiency estimates for individual states. The design of the 1990 assessment will be published in a separate document.

CHANGES IN THE NAEP DESIGN

Although the original design for NAEP was "brilliantly responsive to the political constraints of the time" (Messick, Beaton, & Lord, 1983, p.1), the structure of NAEP was changed in significant ways in the 1984 assessment and evolved even further in 1986. The design of the 1986 National Assessment is discussed fully in Chapter 1. The rationale for the major design changes is discussed here.

In measuring student progress over time, it is essential that NAEP remain stable in order to maintain the comparability of the results from one assessment year to another. However, as the concerns of educational policymakers change and as new technologies become available, it is important to modify NAEP in order to increase its relevance and maintain its technical excellence. This tension between stability and change has presented, and continues to present, a challenge to the technical staff of NAEP.

Since receiving the grant in 1983, ETS has instituted a number of modifications in the way that NAEP is administered and its data analyzed. Balanced incomplete block (BIB) spiralling and IRT scaling were introduced in the 1984 assessment of reading and writing. Another modification to that assessment was the addition of grade-level sampling. Data were collected not only for students aged 9, 13, and 17 (as in past assessments) but also for students in grades 4, 8, and 11. These changes have been reported previously (Messick, Beaton, & Lord, 1983; Beaton, 1987a).

In 1986, reading, mathematics, science, and computer competence were assessed at grades 3, 7, and 11 and ages 9, 13, and 17. At grade 11/age 17 only, U.S. history and literature were also assessed. Since NAEP had not assessed computer competence, history, or literature before, there were no trend results to which new results could be compared and thus no opportunity to study the effects of changes. However, reading, mathematics, and science had been assessed several times in the past; thus, it was necessary to see what effects the changes in methodology had on the trend data for these three subject areas.

There were two major differences in the design of the 1986 assessment from past assessments:

- The definitions of the age populations and the time of year in which the assessment was administered were changed.

- Mathematics and science were assessed for the first time using only printed instructions and items, eliminating the paced aural presentation by tape recorders used in past assessments.

The changes in age and time of testing were introduced to make NAEP definitions uniform. In pre-1986 NAEP, the definition of age for 17-year-olds was not consistent with the definitions for 9- and 13-year-olds, with the result that, although all 9-year-olds would be eligible for the 13-year-old sample in four years, most of NAEP's 13-year-old students would not be eligible for the 17-year-old sample four years later. Also, pre-1986 assessments sampled 13-year-olds in the fall, 9-year-olds in the winter, and 17-year-olds in the spring, with the result that the apparent four-year difference between age samples was actually something different. In 1986 NAEP introduced consistent definitions of age and assessment of all ages at the same time of year.

The change from tape-recorded to printed administration was necessitated by the introduction of BIB spiralling. Before the 1984 assessment, NAEP was administered using matrix sampling and all students at an assessment session were assigned exactly the same items. It was possible, and deemed desirable, to administer the assessment using a tape recorder. However, the tape recorder had a negative effect on one of NAEP's aims--to develop items that can be used in other settings. Few other users of NAEP items chose to use tape-recorded administration. Also, since BIB spiralling assigned different assessment items to different students in the same session, administration by a single tape recorder was no longer feasible.[2] For these and other reasons, the traditional tape-recorded administration method was replaced by a paper-and-pencil administration. In 1986, the change from tape-recorded to printed administration was new only for mathematics and science; reading had already been assessed using printed administration in 1984.

The main strategy used to protect the stability of NAEP as changes are introduced into the NAEP design has been the "bridge study." A bridge study entails collecting two separate but comparable sets of data. In order to maintain comparability with past assessments, one national sample of students is assessed using the same methods as in the past, duplicating as closely as possible past administrative procedures. Another, equivalent sample is also assessed, using the new methods and procedures. The data from the two samples can then be compared and the effect of the changes, if any, estimated. If the two sets of data are equatable, then the data from the past assessments can be adjusted to make them comparable to the new, or vice versa. If the data from the two samples are so different as to be non-equatable, the trend is continued using only the students assessed with the older methodology. Future assessments can be made comparable to either, depending on whether or not the value of the changes outweighs the value of the trend data. Two bridge studies were conducted in 1986: one to study the effect of changing the definitions of age and the time of year in which the assessment occurred and another to study the effect of changing the method of administration.

---

[2] BIB spiralling is described in Messick, Beaton, and Lord (1983) and Beaton (1987a).

IMPLEMENTATION OF THE NAEP DESIGN

The implementation of the 1986 NAEP design involved a large number of steps which are described briefly in the next chapter and then in some detail in Chapters 2 through 6. First, Learning Area Committees were formed to set the objectives for the several subject areas that were assessed. The reading, mathematics, and science items from past assessments were reviewed and reorganized, and new items developed and pretested in mathematics, science, computer competence, U.S. history, and literature. Background and attitude questions for students were selected or developed. Questionnaires for teachers, principals, computer coordinators, and excluded students were developed. Altogether, 56 different assessment booklets or questionnaires were printed for use at the elementary school level, 72 at the intermediate level, and 97 in the high schools.

Field administration was performed by Westat. Staff were recruited and trained in the randomly selected areas of the country where the assessment took place. Individual states, school districts, and schools were encouraged to participate. The assessment was administered in over 1,500 schools. The various forms and booklets were accounted for and returned to ETS. Quality control procedures were implemented and reviewed.

ETS had to assure that it received complete data from the field administrators. After receiving data, ETS professionally scored open-ended items and entered the data into its computers. While most of the data were machine-readable, some questionnaires were key-entered and verified. All data were carefully edited and placed in an integrated database. Careful quality control checks were made before the data were considered ready for data analysis. Westat prepared sampling weights for each student in the sample. ETS then placed the data on public-use data tapes and prepared user documentation.

After completion of the database with sampling weights, the data analysis and reporting process proceeded. The analysis process consisted of reviewing individual items to assure their correctness, then developing anchored scales. The scaled data were analyzed and tabulated in many ways. Reporting interacts with analysis, and consists of identifying the issues of interest, specifying data analyses, reviewing and interpreting results, and then preparing documents for review, revision, and printing.

CHANGES IN NAEP ANALYSIS

Part II of this report describes the procedures used to analyze the 1986 data. These procedures are summarized in Chapter 7 and presented in detail in Chapters 8 through 14. In this section, only major differences in analytic procedures from past assessments will be noted.

Since its inception, NAEP has had as its goal reporting to the interested public what students can and cannot do. NAEP was designed to report the achievement of students in the United States as a whole and in subpopulations such as groups based on regions of the country, ethnicity, and gender. However, the way in which these goals have been achieved has evolved over time.

At first, NAEP reported what students knew and could do by estimating and publishing the proportion of students who could pass particular items, with the result of reporting with little summarization and in more detail than most audiences wanted. Reporting procedures were quickly modified to focus on estimating and publishing the proportion of students who could answer correctly certain specified populations of items. Although the data could be summarized in this way, the approach restricted the measurement of change over time to groups of items that were identical in several assessments and restricted the ways in which the data could be interpreted.

Since receiving the NAEP grant in 1983, ETS has used scaling technology to report student achievement. Using scaling technology does not preclude alternative reporting to maintain continuity with the past. Although NAEP now emphasizes scales in its reports, it makes its data available on fully documented public-use data tapes so that anyone interested may find out how students did on any or all of the items that were administered. For comparability with the past, NAEP continues to publish the average percentage correct for groups of items that were administered at different times.

The scaling within NAEP's different learning areas is heavily dependent on knowledge of the interitem correlations. In simplest terms, the main idea is that if the items could be placed in such an order that a person's answering an item correctly at a particular difficulty level implied that he or she could answer all easier items, knowing the most difficult item a student could answer correctly would imply what that student could and could not do for the entire population of items. Of course, few, if any, sets of real items are so rigidly ordered, and such ordering is clearly impossible where guessing is allowed. However, other, less demanding, item response theory (IRT) models are available to be applied when the data are approximately unidimensional. In the 1984, assessment the introduction of BIB spiralling, a complex variant of multiple matrix sampling, facilitated the collection of interitem data in such a way that dimensionality could be explored.

If the dimensionality study showed that the items fell approximately on a single dimension, a single scale could summarize most of the information about student performance quite adequately. If the items fell on more than one dimension, a scale for each dimension would have to be developed, if sufficient data were available to support the scaling process; otherwise, other summarization procedures, such as the average percentages used in the past, could be employed. The 1984 NAEP showed that a majority of the reading items could be adequately fit to a unidimensional model and so these reading items were scaled. Using the ordering of the items, the reading scale was behaviorally anchored so that points on the scale could be interpreted as levels of proficiency, describing what students at those levels could and could not do. The 1984 writing items were scaled using an alternative method that did not require the assumption of unidimensionality.

In 1986, the scaling technology was extended to subscales. It was assumed, a priori, that a single scale would not suffice for reporting mathematics and science. Multivariable scaling technology was developed to create subscales representing various categories of items that would be of interest to various audiences. Thus, several subscales were developed for mathematics and for science. In order to maintain a single overall measure of performance for each subject area, a global composite was also created for mathematics and for science. The global composite was anchored for each of these subject areas using a new technology developed for this purpose.

THE EFFECT OF THE CHANGES

The changes in the design and analysis of the National Assessment were intended to facilitate analysis and reporting of NAEP data, and have done so. Our concern here is whether the changes in design have maintained the comparability of the newly collected data with the data collected by NAEP since its first data collection in 1969-70.

The bridge samples that were collected to measure the effect of the changes made in the 1986 NAEP design were analyzed and the results are presented in a separate report entitled National Assessment of Educational Progress 1986 Bridge Studies (Kaplan, Beaton, Johnson, & Johnson, 1988). That report concluded:

> "...the effect of change in the mode of administration, while present, is accurately predictable and does not differentially affect the measures of performance for any of the subpopulations studied. The effect of the change in age definition and time of testing is more noticeable, is in the expected direction, and does not differentially affect the measures of performance for the vast majority of the assessed [sub]population[s]. Consequently, the data from the past assessments can justifiably be adjusted to make them comparable with the data from the 1986 assessment."

However, an anomalous situation arose in the analysis of the reading data. The reading data were collected in the same way as in the 1984 assessment, to which performance was to be compared. Analysis of these data showed an inexplicable decline in reading proficiency, a decline so large as to be suspect. Eminent outside educational researchers also examined the NAEP reading results and concurred with the NAEP staff in their judgment that the results were unusual and advised further investigation. This decline was carefully investigated and documented in The NAEP 1985-86 Reading Anomaly: A Technical Report (Beaton, 1988). That report states:

> "The results of the studies of the reading anomaly are inconclusive. Some hypotheses, such as inaccuracies in sampling, scaling, and quality control, can be ruled out beyond any reasonable doubt. However, some changes in the assessment process are inevitable, and these changes are documented in this report. The possibility that one or a combination of such changes may have

resulted in the declines in reading proficiency cannot be ruled out. The effect of such changes cannot be estimated from existing data."

Since the reading trend data have been deemed anomalous, the reading trend results have not yet been published. The 1988 NAEP design has been modified to collect additional data to help explain or sustain the unusual results from the 1986 reading trend analyses. The reading trend results will be published after the new data are collected and analyzed.

THE NAEP DATABASE AND PUBLIC-USE DATA TAPES

All of the data collected during the 1986 national assessment are available on public-use data tapes, except for information that would breach confidentiality agreements by identifying individual states, schools, teachers or students. These tapes are fully documented in the National Assessment of Educational Progress 1985-86 Public-Use Data Tapes Version 2.0 Users' Guide (Rogers, Kline, Norris, Johnson, Mislevy, Zwick, Barone, & Kaplan, 1988).

The NAEP staff was greatly concerned not only with producing its own reports but also with making its public-use data tapes available in a format which would be as easy for others to use as possible. The purpose of the public-use data tapes is to allow others to check our analyses, to perform alternate analyses using different methods, and to perform analyses for other purposes. The public-use data tapes are formatted for and have parameter statements for the commonly used statistical systems SAS and SPSS.

Despite the substantial effort devoted to making the public-use data tapes as easy to use as possible, it is impossible to make the use of a database as complex as NAEP's completely simple. A secondary user cannot use the database effectively without some knowledge of the NAEP design. For example, sampling by grade and age forces the user to consider which subsample is appropriate for a particular analysis. BIB spiralling results in a substantial amount of data which is missing by design (over 90 percent!); thus, the user must think carefully about missing data procedures. Although we have tried to make the public-use data tapes as easy to use as possible, their use will require some investment in understanding NAEP.

Two features of the tapes give the user additional analytic power. Most complex surveys require sampling weights to achieve proper population estimates, and the weights are supplied for use in analysis. This has been done for NAEP. However, with a complex sampling design, the weighted versions of standard formulas for independent and identically distributed variables are not appropriate for estimating sampling errors; while appropriate formulas can be developed, they are complex to apply. Some other method based on pseudoreplicates, such as the jackknife, is appropriate and simple in application. We have developed and applied one form of the jackknife method, which we have used in all NAEP analyses. It requires 38 sampling weights for each student in addition to the sampling weight usually supplied. All of these weights are provided on the public-use data tapes in a way that makes possible the approximate estimation of sampling error using standard statistical systems as opposed to specialized software designed for survey data. Since this ability comes with the cost of more computing time, the secondary user may use this new ability or not, as he or she deems appropriate.

The other feature of the public-use data tapes is that they exceed the standard practice of providing only raw data by also providing derived variables for reading and writing. The complexity of the IRT scaling analysis prompted this inclusion. The underlying rationale follows.

The item-sampling designs that have characterized NAEP since its inception provided efficient estimates for average levels of performance in groups of students, but are too sparse to yield accurate estimates for individual students. Until 1984, NAEP reported only estimates of the proportions of students who could answer individual items or sets of items correctly, avoided estimating student proficiency distributions, and did not make individual proficiency measures available to the secondary user. The lack of individual proficiency measurements encumbered analyses of the relationships between proficiency and student characteristics. Regrettably, it is common in educational surveys to carry out these latter analyses with poorly estimated scores for individuals, despite the demonstrable invalidity of their results (see Goldstein, 1980).

Recent developments in item response theory, in statistical estimation procedures, and in methodologies for handling missing data make it possible to estimate accurately student proficiency distributions and their relationships with background variables from complex, sparse sampling designs. The embodiment of these advances, the derived variables called "plausible values" for reading and writing, were constructed to yield consistent estimates of such population characteristics for the NAEP populations as a whole, and for the subpopulations defined by the traditional NAEP reporting categories. The intricacies and expense involved in obtaining optimal estimates from such a complex database for a specific analysis may prove prohibitive to most secondary analysts; thus, the plausible values mentioned above are provided for exploratory analyses. Part II of this report provides details on the construction and properties of plausible values and caveats on their use.

ORGANIZATION OF THE TECHNICAL REPORT

The organizational strategy for this report is to first provide overviews of the two components of NAEP described herein, design and analysis. These overviews direct the reader to chapters where details are provided. Each chapter begins with a summary, then presents a detailed exposition of its topic. In some cases, chapters refer to appendices or supplementary documents which contain even more detail. This strategy has been adopted to aid the reader in reaching areas of special interest. The reader who wishes only a summary may read just the overviews (Chapters 1 and 7).

The chapters are separately authored and differ somewhat in style and point of view. In most cases, the person most responsible for the activity was assigned the writing task. We hope that the chapters can be read independently, after the appropriate overviews are read. Although we have tried to cross-reference where necessary, the method of organization necessarily results in some redundancy from chapter to chapter.

PART I

CHAPTER 1

Overview of Part I: The Design and Implementation of 1986 NAEP

Chapter 1

OVERVIEW OF PART I: THE DESIGN AND IMPLEMENTATION OF 1986 NAEP

Albert E. Beaton

Educational Testing Service

This chapter provides a description of the 1986 NAEP design and an overview of the processes by which NAEP evolved from the planning stage into a database ready for analysis. The major components of the assessment, with few details, are presented here with references to the appropriate chapters in Part I for more information. Although these chapters contain most of the important details about the design and implementation of the 1986 assessment, some of the chapters direct the reader to even greater detail to be found in appendices and supplementary documents. The report is organized to help an interested reader first to locate the areas of his or her interest, then to study those areas in as much depth as necessary to understand the procedures and considerations involved in the collection of NAEP data. From this report, it is hoped that the reader will be provided with a comprehensive overview of the 1986 assessment and will be able to judge the quality, strengths, and weaknesses of the data.

This part of the technical report does not include a discussion of the procedures used in data analysis; these are summarized in Chapter 7 (the overview of Part II) and discussed in detail in Chapters 8 through 14. This report does not include the substantive results of the 1986 assessment, which are published separately in NAEP cross-sectional and trend reports on student achievement in individual subject areas.

The contents of this chapter are as follows:

- To provide background, section 1.1 presents the NAEP assessment schedule from the first year of data collection in 1969 to the 1986 assessment. The assessments in progress or planned through 1990 are also mentioned.

- An overview of the NAEP design for 1986 is presented in section 1.2. The general ETS approach to the design of NAEP is covered extensively in A New Design for a New Era (Messick, Beaton, & Lord, 1983) and Implementing the New Design: The NAEP 1983-84 Technical Report (Beaton, 1987a).

- The NAEP 1986 four-stage stratified random sampling procedure is described in section 1.3. Sampling is described more fully in Chapter 3.

- The development of the objectives and items for different subject areas and the processes by which they were reviewed is summarized in section 1.4 with more detail provided in Chapter 2.

- The assignment of the NAEP cognitive and background and attitude questions to booklets is presented in section 1.5. Detailed information is presented in Chapter 4.

- The field administration procedures, including the training of the field administrators, attaining school cooperation, assessment administration, and quality control are summarized in section 1.6; more description is given in Chapter 5.

- The flow of data from their receipt at ETS through data entry, professional scoring, and entry into the database in final form, ready for analysis is summarized in section 1.7 and presented in detail in Chapter 6.

The data collected in the 1986 assessment have been prepared for public use in the form of a set of data tapes, documented in the National Assessment of Educational Progress 1985-86 Public-Use Data Tapes Version 2.0 Users' Guide (Rogers, Kline, Norris, Johnson, Mislevy, Zwick, Barone, & Kaplan, 1988). These tapes contain the data available for the sampled students, their teachers, students excluded from the sample, principals, schools, and computer coordinators.

1.1 ASSESSMENT SCHEDULE

The coverage of assessments through 1986 is shown in Table 1.1. As this table illustrates, the subject areas assessed over the years have been many and varied, including not only reading, writing, mathematics, and science, but many other areas as well--social studies, citizenship, literature, art, music, and career development. Many subject areas have been re-assessed periodically to determine trends in achievement over time. Note that, by decision of the Learning Area Committee for literature (see section 1.4), the 1986 literature assessment did not cover the same material as that of 1971; thus, there were no overlapping items and analyses of trends in literature could not be performed.

Assessments were conducted annually through 1980, but budget restrictions since then have reduced data collection to a biennial basis. Since its inception, NAEP has assessed 9-year-olds, 13-year-olds, and in-school 17-year-olds, although the definitions of 9- and 13-year-olds changed in 1986 (see section 1.2). Budget restrictions have forced NAEP to eliminate the routine assessment of out-of-school 17-year-olds and young adults. However, in 1985 a separately funded assessment of the literacy of young

Table 1.1
National Assessment of Educational Progress
Subject Areas, Grades, and Ages Assessed: 1969-1986

		GRADES/AGES ASSESSED									
ASSESSMENT YEAR	SUBJECT AREA(S)	Grade 3	Grade 4	Age 9	Grade 7	Grade 8	Age 13	Grade 11	Age* 17IS	Age* 17OS	Age ADULT
Year 1/1969-70	Science			x			x		x	x	x
	Writing			x			x		x	x	x
	Citizenship			x			x		x	x	x
Year 2/1970-71	Reading			x			x		x	x	x
	Literature			x			x		x	x	x
Year 3/1971-72	Music			x			x		x	x	x
	Social Studies			x			x		x	x	x
Year 4/1972-73	Science			x			x		x	x	x
	Mathematics			x			x		x	x	x
Year 5/1973-74	Career and Occupational Development			x			x		x	x	x
	Writing			x			x		x	x	
Year 6/1974-75	Reading			x			x		x	x	
	Art			x			x		x	x	
Year 7/1975-76	Citizenship/Social Studies			x			x		x	x	
	Mathematics**			x			x		x	x	
Year 8/1976-77	Science			x			x		x		
	Basic Life Skills**								x		
	Health**									x	
	Energy**									x	
	Reading**									x	
	Science**									x	

* IS: enrolled in public or private schools; OS: dropped out of school or graduated prior to assessment.
**Small, special-interest assessment conducted on limited samples at specific grades or ages.

Table 1.1
(continued)

		GRADES/AGES ASSESSED									
ASSESSMENT YEAR	SUBJECT AREA(S)	Grade 3	Grade 4	Age 9	Grade 7	Grade 8	Age 13	Grade 11	Age* 17IS	Age* 17OS	Age ADULT
Year 9/1977-78	Mathematics			x			x		x		
	Consumer Skills**								x		
Year 10/1978-79	Art			x			x		x		
	Music			x			x		x		
	Writing			x			x		x		
Year 11/1979-80	Reading			x			x		x	x	
	Literature			x			x		x	x	
Year 12/1980-81	NO DATA COLLECTION										
Year 13/1981-82	Mathematics			x			x		x		
	Citizenship/Social Studies			x			x		x		
	Science**			x			x		x		
Year 14/1982-83	NO DATA COLLECTION										
Year 15/1983-84	Reading		x	x		x	x	x	x		
	Writing		x	x		x	x	x	x		
Year 16/1984-85	Literacy**										x
Year 17/1985-86	Reading	x		x	x		x	x	x		
	Mathematics	x		x	x		x	x	x		
	Science	x		x	x		x	x	x		
	Computer Competence	x		x	x		x	x	x		
	Literature**							x	x		
	U.S. History**							x	x		

* IS: enrolled in public or private schools; OS: dropped out of school or graduated prior to assessment.
**Small, special-interest assessment conducted on limited samples at specific grades or ages.

3

23

adults was administered. The results have been published in Literacy: Profiles of America's Young Adults, Final Report (Kirsch & Jungeblut, 1986) This survey also collected a small sample of out-of-school 17-year-olds.

Table 1.1 also indicates the initiation of data collection by grade as well as by age in 1984, a practice that was continued in the 1986 assessment.

Assessments through 1990 are either in progress or in the planning stage. The 1988 assessments of reading, writing, mathematics, science, civics, U.S. history, and geography are in progress. Current plans call for the assessment of reading, mathematics, and science in 1990.

1.2 THE 1986 NAEP DESIGN

The 1986 National Assessment was designed not only to assess student performance in 1986 but also to measure changes from past performance of students in American schools. Because new age definitions and times of testing were introduced into the 1986 assessment, the design was adjusted to ensure the proper measurement of any changes from performance in earlier assessments conducted using the old definitions. This section describes that design.

The design of the 1986 national assessment included eight samples that differed in important ways. The samples can be classified into three different types:

- **Main NAEP (spiral) samples**. These are the largest samples and incorporate modifications from past assessments in population definition and assessment technology. These samples are not directly comparable with past NAEP data.
- **Trend (Bridge A) samples**. These samples employ the population definitions and assessment technology of past assessments and thus are directly comparable with past NAEP data.
- **Method (Bridge B) samples**. These samples are from the same populations as the main NAEP samples but are measured in the same way as were past assessments. Their purpose is to measure the effect of the modifications that were implemented in the 1986 assessment.

The following sections describe the attributes of these samples. The design is summarized in Table 1.2.

Table 1.2
NAEP 1986 Student Samples

	Fall 11/4/85 - 12/4/85	Winter 1/6/86 - 1/31/86	Spring 2/17/86 - 5/2/86
Age 9		(9a) Bridge A: RMS (6,932) [Mixed, CY, Age, MG-4]	(9) Main NAEP: RMSC (21,287) [Print, Not CY, A/G MG-3] (9b) Bridge B: MS (4,042) [Tape, Not CY, Age, MG-3]
Age 13	(13a) Bridge A: RMS (6,200) [Mixed, CY, Age, MG-8]		(13) Main NAEP: RMSC (27,668) [Print, Not CY, A/G MG-7] (13b) Bridge B: MS (4,178) [Tape, Not CY, Age, MG-7]
Age 17			(17) Main NAEP: RMSCHL (39,753) [Print, Not CY, A/G, MG-11] (17b) Bridge B: MS (3,868) [Tape, Not CY, Age, MG-11]

Legend

R - Reading
M - Mathematics
S - Science
C - Computer competence
H - U.S. history
L - Literature

CY - Calendar year
MG - Modal grade
A/G - Both age and grade sample selected

Print - printed administration
Tape - tape-recorded administration
Mixed - mathematics and science administered by tape recorder, but reading administered by print

Targeted sample sizes are in parentheses ( ).
Teacher questionnaires were distributed to teachers of the main NAEP sample; excluded student questionnaires were used for all samples.

1.2.1 The NAEP Samples

The main NAEP samples, denoted (9), (13), and (17) in Table 1.2 incorporate all of the NAEP modifications introduced in 1986:

1) Students were defined as being age 9, age 13, or age 17 if they were born between October 1 and September 30 in the appropriate preceding years, that is,

   Age 9: October 1, 1976 to September 30, 1977
   Age 13: October 1, 1972 to September 30, 1973
   Age 17: October 1, 1968 to September 30, 1979.

   This definition of birthdates is of the same form as NAEP has used in past assessments for 17-year-olds but differs for 9- and 13-year-olds, who were previously defined on a calendar-year (January 1 to December 31) basis. This modification defines the three populations in an equivalent way; consequently, they may be considered as cohorts who were born four years apart.

2) Changes in age definitions for 9-year-olds and 13-year-olds also changed their corresponding modal grades (the grade attended by most of the students in that age group) Under the past NAEP definitions, at the time of assessment most of the 9-year-olds had been in 4th grade, most of the 13-year-olds had been in 8th grade, and most of the 17-year-olds had been in 11th grade. Under the new definitions, most of the 9-year-olds were in 3rd grade and most of the 13-year-olds were in 7th grade. Since the definition of the 17-year-old sample did not change, the modal grade for these students remained 11th grade. This modification resulted in the grades sampled being four grades apart (grades 3, 7, and 11) rather than irregularly spaced (grades 4, 8, and 11) as in the past.

3) All populations were defined by both age and grade levels. That is, a student was eligible for assessment if he or she was either 9-years-old or in the 3rd grade, 13-years-old or in the 7th grade, or 17-years-old or in the 11th grade. Sampling by both grade and age, or "grade/age" sampling, was introduced in the 1984 assessment. The purpose of grade/age sampling was to permit data to be analyzed either by age, as in the past, or by grade, which is often preferred.

4) Students were all assessed near the end of the school year. We refer to this assessment period as the "spring" even though the assessment administration started on February 17 and continued until May 2, 1986. Assessing all ages at the same time of year allows a full four years of average academic growth between age populations.

5) Students were assessed in reading, mathematics, science, and computer competence. A subset of the grade 11/age 17 students was assessed in U.S. history and literature.

6) The main NAEP sample included a specially funded, separate probe of language minority students. Some language minority students were assigned a separately developed booklet with a section of NAEP reading items, a section of NAEP mathematics items, and a separate section that included items of special relevance to language minority students. This study is reported in The Educational Progress of Language Minority Children: Findings from the NAEP 1985-86 Special Study (Baratz-Snowden, Rock, Pollack, & Wilder, 1988).

7) All samples were administered using BIB spiralling (see Messick, Beaton, & Lord, 1983; Beaton, 1987a) and thus used printed instructions. The various subject areas were spiralled together so that of the three item blocks administered to each student a particular student might receive, for example, three reading blocks; some combination of reading blocks and blocks from other subject areas; or no reading blocks and three blocks from other subject areas. BIB spiralling was introduced in the 1984 assessment of reading and writing and was used for assessments of mathematics and science for the first time in 1986.

1.2.2 Trend Samples

The several design changes introduced into the main NAEP samples clearly make comparisons with past assessments difficult, and so several other samples were collected for use in trends. These samples were defined and administered in the same way as were past assessments. These samples are denoted (9a), (13a), and (17b) in Table 1.2.

The samples (9a) and (13a) contained 9-year-olds and 13-year-olds, respectively, who were sampled using the same calendar-year age definition used in past assessments. The ages were defined as follows as being born on or between the following dates:

Age 9: January 1, 1976 to December 30, 1977
Age 13: January 1, 1972 to December 30, 1973
Age 17: October 1, 1968 to September 30, 1969.

No attempt was made to augment the age 9 sample with other 4th graders or the age 13 sample with other 8th graders since NAEP did not traditionally assess grades. These samples were assessed in reading, mathematics, and science since these were the only subject areas in which trend data were available for comparison. Reading was measured using printed administration, matching the procedures from the 1984 assessment, with which the data were to be compared. Mathematics and science were assessed using tape-recorded administration, matching the procedure used in the several previous assessments with which performance was to be compared.

The assessment of these samples was scheduled as in the past, with the 9-year-old students assessed in the winter and the 13-year-old students assessed in the fall of the school year. However, the age 9 sample was assessed only during January 1986, a somewhat earlier time span than for past assessments.

Since the definition of age and the time of assessment were not changed for the 17-year-olds, the major change in 1986 for this sample was the use of printed instructions instead of a paced aural presentation by tape recorder. For comparison with past data, a method sample, (17b) in Table 1.2, was appropriate. The sample differed from the main NAEP sample (17) in that the assessment was administered using a tape recorder and that only mathematics and science were assessed. A bridge sample for reading was not necessary for 17-year-olds since the main NAEP sample for 1986 was similar in design to that for 1984.

1.2.3 Method Samples

The NAEP design also included several samples for measuring the effect of changing from administration by tape recorder to administration by print. These samples are denoted (9b), (13b), and (17b) in Table 1.2. These samples were selected from the same populations as the main NAEP samples; thus, their proficiencies in various subject areas can be expected to be the same as those of the main samples. In principle, since the only differences between these samples and the corresponding age subsamples of the main NAEP samples are due to changing from tape-recorded to printed administration and due to sampling error, comparing these samples can allow the estimation of the effects of changing methodology.

Ages were defined in the same way as for the main NAEP sample, that is, the students would be eligible for selection if born on or between the following dates:

Age 9: October 1, 1976 to September 30, 1977
Age 13: October 1, 1972 to September 30, 1973
Age 17: October 1, 1968 to September 30, 1969.

All three of the method samples were assessed only in mathematics and science, since these were the only areas that changed in method of administration since their last assessments. The samples were of age groups only, not grades, since past assessments used age-only sampling.

1.3 THE NAEP SAMPLING PLAN

The NAEP populations comprised students of various ages and grades in the 50 states and the District of Columbia. Both public and private school students were sampled. The precise subpopulations varied in different samples. In the main NAEP samples and the samples used to investigate the effect of changes in administrative procedures, 9-, 13-, or 17-year-olds were defined in such a way that the majority of them were in, respectively, 3rd, 7th, and 11th grades (the modal grades). In trend samples, which defined age in the traditional NAEP manner, the majority of the 9-year-olds were in the 4th grade and the majority of the 13-year-olds were in the 8th grade.

The entire NAEP data collection effort involves a four-stage probability sample. The original sampling plan for NAEP was designed by the Research Triangle Institute but has been modified by Westat, Inc. The four stages are summarized briefly below and in somewhat more detail in Chapter 3. For a full description of the sampling plan, see National Assessment of Educational Progress--17th Year Sampling and Weighting Procedures, Final Report (Burke, Braden, Hansen, Lago, & Tepping, 1987).

Stage 1: Primary sampling units. In the first stage of sampling, the United States was divided into geographical units comprising counties or groups of contiguous counties that met a minimum school enrollment size. These units, called primary sampling units (PSUs), were classified into 12 strata, which were defined by region (Northeast, Southeast, Central, West), by type of PSU (MSA [metropolitan statistical area], non-MSA) and by percent minority (less than 20 percent, 20 percent or more). Ninety-four PSUs were selected from a total of 1,027. Among the larger PSUs, 34 were selected with certainty. Within each major stratum, further stratification was achieved by ordering the noncertainty PSUs according to additional socioeconomic characteristics. Sixty other PSUs were selected from the noncertainty PSUs with probability proportional to size.

Stage 2: Sampling schools. In the second stage of sampling, the frame consisted of a file of schools obtained from Quality Education Data, Inc. The file included public, private, Catholic, Bureau of Indian Affairs, and Department of Defense schools, listed according to size and separately for the three grade/age groups, within each of the 94 PSUs. High minority schools were assigned extra weight to increase the probability of selection and thereby increase minority sample sizes. Schools with fewer than 20 estimated grade/age eligibles were assigned lower weights because of the high costs of administration. The method of assigning weights to other schools is discussed in Chapter 3. Schools within each PSU were selected (systematically with random start and without replacement) with probability proportional to assigned size.

Stage 3: Assignment of sessions to schools, by type. In the third stage of sampling, assignment of sessions to schools was done separately by the three types of sessions, designated "spiral", "Bridge A", and "Bridge B," which represent separate samples of the population of students. Schools selected for Bridge A samples were excluded from the spiral and Bridge B samples because the Bridge A assessments took place during a different time of year. Except in the case of a smaller school, both spiral and Bridge B sessions were conducted in each Spring-selected school. Smaller schools were assigned randomly to either spiral or Bridge B assessment.

Stage 4: Sampling students. In the fourth stage of sampling, a consolidated list of all grade- and age-eligible students was established for each selected school. A systematic selection of eligible students was made and, for schools in the spring assessment, students were assigned to spiral or Bridge B sessions, depending on whether the assessment was to be administered by pencil and paper (spiral) or by tape recorder (Bridge B).

Stage 4a: Sampling excluded students. Some selected students were deemed unassessable by school authorities because they had limited English language proficiency, were judged as being educable mentally retarded, or were functionally disabled. In these cases, an excluded student questionnaire was filled out by the school staff listing the reason for excluding the student and providing some background information.

Stage 4b: Sampling teachers. The teacher questionnaire was administered to the teachers of a subsample of the students sampled for spiral sessions. The purpose of this sample was to estimate the number (proportion) of students whose teachers had various attributes, not the percent of the teacher population who had various attributes. Therefore, statements such as "20 percent of students have teachers who have..." are appropriate in discussing teacher questionnaire data, but statements such as "20 percent of teachers have..." are not.

One subject area was designated for each spiral-allocated school. For grade 3/age 9, the subject area was always reading. For grade 7/age 13, the subject area could have been reading, mathematics, or science. For grade 11/age 17, the subject area could have been reading, mathematics, science, or U.S. history. Teachers of only one such subject area were sampled in a school.

For each spiral session in each school, a subsample of students was selected and the school coordinator was asked to identify, for each selected student, the teacher in the designated subject area who was teaching the student. (For reading, English or language arts teachers were selected.) These teachers were asked to complete the teacher questionnaire. Since a number of students may have had the same teacher, and some teachers did not complete the questionnaire, the number of students in the subsample for whom teacher information is available is not the same as the number of teachers who completed questionnaires in a given school.

Stage 4c: The principal, school, and computer questionnaires. A principal questionnaire, distributed to each sampled school by Westat prior to the assessment, was used by Westat to obtain both an up-to-date estimate of grade/age-eligible students and information on minority enrollment.

The school characteristics and policies questionnaire was distributed in every sampled school. The school characteristics and policies questionnaire was mailed to the school by Westat prior to the assessment, collected by the Westat supervisor, and returned to ETS.

In every school selected for the spiral sample, the school's computer coordinator, if there was one, was asked to fill out a computer coordinator questionnaire. This questionnaire was administered at all grade/age levels.

1.4 DEVELOPMENT OF NAEP ASSESSMENT ITEMS

The 1986 NAEP assessed the performance of students in reading, mathematics, science, and computer competence. NAEP also assessed U.S. history and literature at grade 11/age 17. In addition, a large number of background and attitude questions were asked of the students and information was collected from principals and teachers.

The development of items was supervised by Learning Area Committees, one of which was appointed by the Assessment Policy Committee for each curriculum area. Each Learning Area Committee developed a set of objectives for its area; these objectives represented a consensus of what students at each grade/age level should know and be able to do. Besides items developed to assess academic achievement (cognitive items), the Learning Area Committees also developed items to investigate student attitudes, experiences, and interests (noncognitive items). In addition, a common core of items was developed to collect data about a student's personal and family background.

All items underwent extensive reviews by subject-matter and measurement specialists, as well as careful scrutiny to eliminate any potential bias or lack of sensitivity to particular groups. The items used in each assessment have been made available to anyone interested in studying or using them provided that they agree not to make the items public. The items have traditionally been kept secure for use in future assessments for the examination of trends over time.

All assessment areas except U.S. history and literature contained multiple-choice, short open-ended, and long open-ended items. The open-ended items were professionally scored. The professional scoring process is described in Chapter 6.2.

Details on item development are given in Chapter 2.

1.5 THE NAEP ASSESSMENT BOOKLETS

Booklets containing the items were assigned to the student samples that were selected. The BIB spiralling design of NAEP determined the way in which the assessment booklets were organized and constructed. The type of booklet assigned depended on whether the student was in the spiral or bridge samples. A detailed discussion of this topic can be found in Chapter 5.

1.5.1 Spiral Sample Booklets

The main NAEP sample was assessed using BIB spiralling (see Messick, Beaton, & Lord, 1983; Beaton, 1987a).

The targeted sample size was for 2,000 students to respond to each item at each age or grade level in the spiral sample; this target implied a sample of 2,600 at each grade/age.

The BIB-spiral sample was created to meet the design goal of facilitating the estimation of intercorrelations or other statistics among the assessment items. Using a BIB-spiral design, a large number of booklets was created in such a way that each pair of items was administered to a randomly equivalent subsample of students while maintaining the goal of 2,000 students for each item at both age and grade levels.

Briefly, BIB spiralling was implemented in 1986 as follows:

The items from the different subject areas (e.g., reading, mathematics) were sorted into units called blocks, which were designed to take sixteen minutes for the older students to complete. For the grade 3/age 9 students, the subject area items were expected to take thirteen minutes. Altogether, there were 23 blocks of items used at grade 3/age 9, 30 blocks at grade 7/age 13, and 42 blocks at grade 11/age 17level. Some blocks were administered at more than one age and grade.

These blocks were then assembled into booklets. Each booklet contained a common block and three blocks containing subject area items. The common block contained only background and attitude questions. In a completely balanced incomplete design, the subject area blocks would have been placed in booklets in such a way that each pair of blocks appeared together in one and only one booklet. However, as the number of blocks increases, the number of booklets required becomes large and thus the booklet design called for complete BIB spiralling within each subject area, which is easily manageable, and an incomplete block design between subject areas. (The history and literature books at grade 11/age 17 were for a special probe and were spiralled, but not in such a way that each pair of blocks were assigned to some student.) For the main NAEP sample, 46 booklets were printed for the grade 3/age 9 sample, 62 for the grade 7/age 13 sample, and 90 for the grade 11/age 17 sample.

The booklets for the main NAEP sample were then spiralled and placed into bundles. The spiralling involved interleaving the booklets in a random sequence so that each booklet would occur the appropriate number of times for each item to be administered to approximately 2,600 student in a grade/age sample. The bundle size was 29 booklets, which was intended to be large enough for most assessment sessions with a few books left over. The bundles were designed so that each booklet was at the top of a bundle, in each position in the middle of a bundle, and at the end of a bundle an equal number of times.

With BIB spiralling, the assessment booklets are assigned to students in the same order as the booklets are bundled so that different students in the same assessment session are asked to respond to different items. With spiralling, the instructions to the students and the items themselves must be read by the student from his or her booklet since administration using a tape recorder would be unmanageable with more than one type of booklet in an assessment session. One of the advantages of spiralling is an increase in sampling efficiency.

1.5.2 Bridge A and Bridge B Sample Booklets

The Bridge A and Bridge B booklets could not be BIB spiralled since they were intended for administration by tape recorder as in the past assessments, with the exception of the reading block in each Bridge A booklet. Several special booklets were created for these bridge samples.

Three booklets were printed for Bridge A at grade 3/age 9 and three more for grade 7/age 13. There was no separate Bridge A sample at grade 11/age 17. Each booklet contained one block of reading, one of mathematics, and one of science. A different reading, mathematics, and science block was used in each booklet, thus three blocks from each of these subject areas were administered. The order in which the subject area blocks were presented was changed in the three booklets. See Chapter 4 for details.

In each Bridge A session, all students were administered the same one of the three available booklets. The mathematics and science blocks were administered using a tape recorder, which gave instructions and presented the questions and optional answers aurally. The tape recorder was turned off when the reading block was presented because reading had been bridged in 1984.

Two booklets were printed for the Bridge B sample at each of the three grade/age levels. Only mathematics and science were assessed, since the effect of changing from a tape recorded to printed administration had already been examined for reading. Each booklet contained either two mathematics and one science block or one mathematics and two science blocks. Three mathematics and three science blocks were used altogether. In each Bridge B session, all students were administered the same one of the two appropriate booklets. Both booklets were administered using a tape recorder.

1.5.3 Other Assessment Instruments

The excluded student questionnaire was developed and used for the first time in the 1984 assessment. It was designed to gather more information about particular reasons for which a student was excluded and some basic characteristics of the student, such as race, age, etc.

The teacher questionnaire was also developed and used for the first time in 1984. It was designed to gather information about the attributes of the teachers of the students in the sample and to gather some information about the curricula and teaching methods in the classroom. The questionnaires for the teachers at all grade/age levels had different sections for reading, mathematics, and science curricula and teachers of grade 11/age 17 students had questions about U. S. history and literature curricula.

The school characteristics and policies questionnaire was distributed to each participating school to be completed by either the school's principal or another person familiar with data concerning enrollment, facilities, curricula and staff development.

A questionnaire was also administered to each school's computer coordinator, if the school had one. This questionnaire included questions about subjects in which computer-aided instruction was used, computer courses and subjects taught, and computer resources.

More information about the items and instruments can be found in Chapter 4.

1.6 NAEP FIELD ADMINISTRATION

Westat was responsible for field administration. The process began with the development of necessary materials and a field organization. Materials were developed for training, contacting the schools, sampling, and process control. The field organization consisted of district supervisors and exercise administrators. Westat trained the district supervisors, who in turn trained the exercise administrators.

Gaining school cooperation was primarily the responsibility of Westat, with considerable support from NAEP staff. ETS first contacted the Chief State School Officers, informing them that schools within their states had been selected for NAEP. Later, mailings and materials were sent to the Chief State School Officers, school district superintendents, and private school officials. Meeting arrangements were then established by telephone and contact forms were filed with Westat. Westat district supervisors then scheduled and conducted introductory meetings.

Westat administered the assessment in the field primarily through the work of district supervisors. District supervisors had many responsibilities, including drawing the sample of students, completing assessment reporting forms, making final arrangements for the assessments, supervising exercise administrators, distributing and collecting other data forms and questionnaires, and editing, boxing and shipping assessment materials.

The spiral and Bridge B samples were assessed between February 17 and May 2, 1986 at all grade/age levels. The grade 3/age 9 students in the Bridge B sample were assessed between January 6 and January 31, 1986. For Bridge A samples, the grade 7/age 13 students were assessed between November 4 and December 4, 1985.

An assessment session was expected to last approximately one hour. At the older grade/age levels, the students were allowed six minutes for the common block of questions and 16 minutes for each block of subject matter items and background and attitude questions. The grade 3/age 9 sample was read the common block questions aloud and given 15 minutes to complete that section. Then, they were given 13 minutes to respond to the items in each of the three subsequent blocks.

Both Westat and ETS participated in the quality control and evaluation of the field administration. There were two specifically designed quality control and evaluation studies of the field effort. The first, and most intensive, primarily focussed on quality control and involved on-site visits by Westat and ETS staff to verify the sampling and to observe the supervisors and exercise administrators as they conducted assessments. The second study, an evaluation, was a telephone survey of a 10-percent sample of schools. This survey took place after the field period had ended and all assessment activities had been completed in the schools.

Field administration is discussed in detail in Chapter 5.

1.7 DATABASE CONSTRUCTION

Westat shipped the assessment booklets from the field to ETS for entry into computer files, checking, and forming the database. Careful checking assured that all data from the field were received. The data then went through extensive processing, outlined in Chapters 6 and 6.1.

Since both machine readable (scannable) and nonscannable instruments were used, the "intelligent" data entry system developed for the 1984 assessment was used as well as standard document reading technology. These computer programs not only received the input data but also checked them for consistency among the many different booklets, blocks, and formats. The program assured that all entered values of each variable were within the range of possible values. The entry and editing of materials is discussed in Chapters 6.3 and 6.4.

Many items in each subject area (reading, mathematics, science, and computer competence) required open-ended responses and had to be professionally scored. Professional scoring is discussed in Chapter 6.2.

Extensive quality control checks, described in Chapter 6.5, were instituted to assure correspondence between what had been written in the booklet and what appeared in the database. A random sample of each assessment booklet and questionnaire was selected from the computer file and checked against the original document. The database was determined to be extraordinarily error-free.

The construction of the database and public-use data tapes are described in more detail in Chapters 6.6 and 6.7.

CHAPTER 2

Developing the 1986 National Assessment Objectives, Items, and Background Questions

Chapter 2

DEVELOPING THE 1986 NATIONAL ASSESSMENT OBJECTIVES, ITEMS, AND BACKGROUND QUESTIONS

Ina V. S. Mullis, Walter MacDonald, and Nancy A. Mead

Educational Testing Service

2.1 INTRODUCTION

The 1986 assessment was the most ambitious ever conducted by NAEP, including an extremely complex design, modifications in sampling and administration procedures, substantial numbers of cognitive items for six subject areas, and questionnaires for students, teachers, and school administrators. The development process began in the fall of 1983 when the Assessment Policy Committee determined the subjects to be assessed. In accordance with the newly granted ETS proposal for NAEP, the Assessment Policy Committee identified four curriculum areas to be assessed in 1986:

Reading. This area was highlighted in the ETS proposal for inclusion in each biennial NAEP assessment. Because reading is central to proficiency in other subject areas, levels of reading achievement are likely to serve as an overall barometer of educational progress in our country. Also, with the BIB-spiral design, assessment of one subject in common across various years can be used to link results from year to year, as well as to compare the achievement levels of sets of birth-year cohorts followed in the NAEP assessments.

Mathematics. The NAEP legislation in place through 1988 required that NAEP collect and report at least once every five years data assessing the performance of students at various age or grade levels in each of the areas of reading, writing, and mathematics. This requirement was satisfied for reading and writing in the 1984 assessment; however, because mathematics had not been assessed since 1981-82, it had to be assessed in 1986. Additionally, the decision to assess mathematics made excellent sense because it is an important subject area and, especially considering the timing of previous mathematics assessments, a 1986 assessment would provide valuable information about the performance of birth-year cohorts of students.

Science. Science is another important curriculum area that is currently of much interest and concern to the economic well-being of our country. Although a special science assessment using NAEP materials and data collection procedures had been funded by the National Science Foundation in 1981-82, this subject had not been assessed by NAEP per se since 1976-77.

Computer Competence. It was noted that the BIB-spiral design used in 1986 was especially well suited to supporting thematic assessments, and that with a computer component, the 1986 assessment would provide a great deal of information about students' understanding of technology. Thus, in keeping with the desire to provide baseline information about achievement in this new and burgeoning school subject and to develop an assessment with a unified theme, the Assessment Policy Committee selected assessment of computer competence as the fourth subject area.

In concluding their deliberations about the focus of the 1986 assessment, the Assessment Policy Committee also directed staff to concentrate on the development of materials measuring higher-order thinking skills.

2.2 ASSESSMENT POLICY COMMITTEE APPROVAL OF ASSESSMENT DEVELOPMENT PROCEDURES

In addition to selecting the subject areas to be assessed in 1986 and directing the staff to focus on higher-order thinking skills, the Assessment Policy Committee asked staff to document the procedures that would be used in developing the 1986 assessment materials and to present these to the committee for their approval. This occurred at the February 24-25, 1984 meeting of the Assessment Policy Committee, and the procedures follow, as approved.

2.3 SETTING OBJECTIVES

The procedures followed for determining the objectives to be measured in each curriculum area in 1986 were essentially those followed by NAEP in the past:

1) The objectives used in the previous assessment were mailed to about 25 specialists for their review, comments, and suggestions. No constraints were placed on this activity and we asked for candid, critical reactions. The individuals involved in this process tended to be educators and specialists in the field and were selected to represent differing points of view, geographical locations, backgrounds, and constituencies. We sought advice from a wide range of sources for recommendations for this activity.

2) Learning Area Committees were established to help guide assessment development procedures within subject areas. As with reviewers, the members of each committee were selected with great care to represent differing perspectives and backgrounds. These 21 committee members

(5-6 per subject area) worked closely with NAEP staff in developing the 1986 assessment.

3) Comments from the initial objectives review were synthesized and used as input for the first Learning Area Committee meeting, a combined meeting of all four committees held January 27-29, 1984 (see section 2.6).

4) The first assignment of the respective Learning Area Committees was to review and revise the broad educational objectives for each subject area based on their personal feelings and the comments of the previous reviewers.

5) The new edition of the objectives was, in turn, mailed to practitioners from around the country. These individuals are school administrators and teachers, as well as teacher trainers who live and work in the practical educational environments. Their task was to review these objectives from the point of view of what seems reasonable and practical. Depending upon the results of that review, the objectives were redrafted with the participation of the Learning Area Committee members and others, as necessary.

6) The revised objectives were mailed to a number of members of the lay public for their reactions and opinions. As with earlier steps in the objectives development process, care was taken to be certain that appropriate minority group representatives were included to assure proper attention to these sensitivities.

7) Further modifications of the objectives were made as necessary.

8) The Learning Area Committees completed the final review of the product.

9) The objectives were published, printed, and made available for national distribution.

While the process described above may seem tedious and detailed, it seems an appropriate series of steps to ensure interested parties the opportunity to participate in the objectives development process and to express opinions. (The 400 consultants involved in developing the 1986 objectives are listed at the end of this chapter.)

2.4 PROCEDURES FOR DEVELOPING THE ITEMS

A carefully developed and tested series of steps, essentially those followed in the past by NAEP, were used to create test items that reflect the objectives and that measure achievements related to them:

1) Each Learning Area Committee and the staff of NAEP determined what specific aspects of the objectives could be measured. Each respective committee made recommendations about priorities for the assessment and types of items to be developed. A group discussion regarding measuring higher-order reasoning skills across subject areas was also conducted.

2) The staff then drafted a development and analysis plan delineating the steps to take to create items that would produce or generate the data essential to answer questions the assessment was designed to address.

3) The plan was reviewed by the staff, the Learning Area Committees, and other outside reviewers to provide an opportunity to critique and to assure that no important points were missed.

4) The existing pool of items to be used to measure change from previous assessments (trend items) was reviewed in detail.

5) Item specifications were then developed and prototype items were created to reflect the type of questions that had been suggested. Trend items were selected.

6) Item writers with skills and experience in creating items according to specifications were identified both from inside and beyond ETS and scheduled for item development tasks.

7) Newly created items were reviewed and revised by staff and external reviewers.

8) Further language editing and sensitivity reviews were conducted according to ETS quality control procedures.

9) Field test materials were prepared, including the materials necessary to secure clearance by the Office of Management and Budget (OMB).

10) The field test was conducted with a representative group of students.

11) Field test booklets were scored and the results analyzed.

12) Based on these analyses and the results of the pilot testing, items were revised or modified and re-edited. They once again went through an ETS sensitivity review.

13) With the help of staff and outside reviewers, the Learning Area Committee selected the items to include in the assessment.

14) Items were assembled into "blocks" (14-minute mini-tests) according to statistical guidelines established at the beginning of the process.

15) After a final review and check to assure that each assessment booklet and each block therein met the overall guidelines for the assessment, the booklets were typeset and printed.

2.5 THE FOUNDATIONS OF LITERACY PROJECT

The assessments of basic knowledge in U.S. history and literature were conducted by the Educational Excellence Network in conjunction with NAEP, with support from the National Endowment for the Humanities. Because students cannot build the conceptual understandings necessary for reasoned thought and communication without knowing basic facts within these curriculum areas, the Educational Excellence Network obtained funding from the National Endowment for the Humanities to collect baseline data for educators, policymakers, curriculum builders, scholars, and parents to appraise the extent to which the next generation of Americans possessed the rudimentary knowledge that forms the foundations of literacy.

Although pleased to receive secondary funding to conduct additional assessments, the Assessment Policy Committee (APC) gave serious consideration to the advantages and disadvantages of using NAEP as the vehicle for such a knowledge probe. Previous NAEP assessments of social studies, literature, and reading had included knowledge questions, but this was the first time that assessments would focus exclusively on students' basic knowledge of American history and their familiarity with the major authors, themes, and characters of Western literature. However, the APC acknowledged a growing national concern that a number of young Americans lacked rudimentary knowledge of U.S. history and literature and that systematic information about the acquisition of this knowledge would be quite beneficial. Therefore, they approved NAEP involvement in the Foundations of Literacy project, provided that the assessments be developed and reported using the in-place procedures already approved by the committee and outlined above. Thus, NAEP also developed materials to conduct special probes assessing the basic knowledge of students in U.S. history and literature. Administered in the spring of 1986, these assessments were given only to nationally representative probability samples of 17-year-olds and 11th-grade students, rather than to all three grade/age levels included for the other four subject areas.

2.6 THE INITIAL MEETING OF THE LEARNING AREA COMMITTEES

Although detailed previously, it should be noted that the 1986 NAEP development process was governed by several major considerations:

1) As outlined in the ETS proposal for the administration of the NAEP grant, the development of objectives and items for each curriculum area would be guided by a Learning Area Committee.

2) As specified in the legislation, the objectives would be developed through a consensus process involving subject matter experts, school administrators, teachers, and parents, and the items would be carefully reviewed for potential bias.

3) The ETS Standards for Quality and Fairness (ETS, 1983) describe particular procedures and reviews for all materials developed at ETS.

4) All NAEP items must be submitted to a complex OMB clearance process and all publications, including objectives booklets, submitted for OERI review.

Because of NAEP's goal to unify the four subject area assessments designated by the Assessment Policy Committee through the themes of technology and higher-order thinking skills, the development of the assessment frameworks for all four areas--reading, mathematics, science, and computer competence--was initiated at a combined meeting of the four Learning Area Committees. Held in January of 1984, this combined meeting gave NAEP staff the opportunity to welcome these important committees, explain their general task, present some thoughts about threads of higher-order thinking that could run across assessments, and describe the 1986 design. After the plenary sessions, each committee retired to develop the general framework for the assessment in their subject area. The meeting concluded with a final general session where each group presented its framework and answered questions.

2.7 DEVELOPING THE READING ASSESSMENT

2.7.1 Objectives

The objectives for the 1986 reading assessment (see NAEP, 1987a) were formulated to reflect an interactive view of reading encompassing the type of material being read, the reader's purpose, and the background knowledge that the reader brings to the reading experience. The objectives as such were not limited to particular grade/age levels, since all readers past the earliest period of learning to read engage in all of the activities included.

Four objectives were drafted by the committee, with these and their descriptions reviewed by outside constituencies and revised as necessary. The members of the Learning Area Committee remained involved throughout the review and revision process. While objectives defined from such a consensual process cannot specifically advance either a single theoretical framework or the views of any one individual, they do represent the thinking of a broad cross-section of individuals who are deeply concerned with reading in our schools.

NAEP's 1984 reading objectives reflected the view that the processes of comprehension and the extension of comprehension through interpretation and analysis have a place in reading all kinds of text. Building on this view, the first objective underlying the 1986 assessment was **Comprehends What is Read**. This objective included comprehension of a wide variety of materials as well as materials read for particular purposes. The second objective, **Extends Comprehension**, included deliberate kinds of analysis, interpretation, and evaluation that a student might use when participating in a class discussion or that a reader might develop for a talk or paper. The third objective, **Manages the Reading Experience**, addressed the ability of readers to adopt different strategies depending on the characteristics of different passages, the reader's knowledge and experience with particular kinds of materials, and the reader's purpose for reading. The fourth objective, **Values Reading**, addressed how readers acquire a growing appreciation of the ways reading can affect their lives.

2.7.2 Reading Materials

The Learning Area Committee suggested that a variety of materials were appropriate for use in the assessment and that they be "authentic", i.e., reflect the realities of reading passages, charts, and instructions found in texts, newspapers, and source documents. To this end, the committee suggested that material appearing in the reading assessment be drawn from many sources, including stories, science and social studies textbooks, encyclopedias, magazines, news articles, peer writing, technical writing, and directions.

2.7.3 Item Development

The reading items newly developed for the 1986 assessment were designed by ETS staff and by outside writers trained at a two-day workshop in Princeton. The new items were reviewed by subject-matter specialists and editors at ETS and then submitted to the Learning Area Committee, which conducted a final review and selected materials for field testing. These materials were prepared by staff and submitted to OMB clearance prior to field testing. After field testing (described in section 2.13), the Learning Area Committee met for a third time to review the results and express their preference concerning the use of both trend and newly developed items in the 1986 assessment.

Because reading is not generally taught, per se, after the elementary grade levels, the decision was made to administer the same assessment at grade 7/age 13 and grade 11/age 17 to monitor developmental progress. (However, subsequent analyses indicate that this puts an undue ceiling on the proficiency levels of one group or the other; in 1986, a more challenging assessment at grade 11/age 17 would have been preferable.) The items selected by the Learning Area Committee for inclusion in the 1986 assessment underwent final review by subject-matter specialists, measurement experts, and editors, as well as a review to detect any bias according to the ETS Standards for Quality and Fairness (ETS, 1983).

2.7.4 Reading Background and Attitude Questions

In developing the student background and attitude questions particular to reading, the Learning Area Committee was very interested in addressing not only reading instructional techniques but also some aspects of the reading objectives, including the strategies that students used when reading and the types of reading they were likely to engage in both during and outside of school. They also expressed the view that purpose is an important component of reading, but might be difficult to tap in an assessment situation. Along with selecting the cognitive materials for field testing, discussing background and attitude questions was given high priority at the second meeting of the reading Learning Area Committee in June of 1984. The background and attitude items were field tested with the cognitive items and submitted to a parallel review process. Both cognitive and noncognitive items were prepared as part of the clearance package submitted to the government for review and OMB clearance for the 1986 assessment.

2.8 DEVELOPING THE MATHEMATICS ASSESSMENT

2.8.1 Objectives

In keeping with NAEP procedures, the objectives for the 1986 mathematics assessment (NAEP, 1986a) were derived through a process of review and revision. First, 25 mathematics educators and classroom teachers reviewed the objectives used for the previous assessment in 1981-82. Their responses were collated by staff and given to the Learning Area Committee at its first meeting for use in updating the objectives for the 1986 assessment. The subsequent draft prepared by the committee was reviewed by another panel of 25 reviewers, which submitted additional comments and suggestions. These responses, collated by staff members, were used by the mathematics Learning Area Committee to prepare the final set of mathematics objectives.

The final description of what was to be assessed in 1986 was organized according to a matrix of five broad process areas by seven content areas. Although all objectives were intended to involve elements of problem solving, the five process areas included: problem solving/reasoning, routine application, understanding/comprehension, skill, and knowledge. The content categories, drawn primarily from elementary and secondary school mathematics up to but not including calculus, included the following: fundamental methods of mathematics; discrete mathematics; data organization and interpretation; measurement; geometry; relations, functions, and algebraic expressions; and numbers and operations.

2.8.2 Item Development

Mathematics items were newly developed for the 1986 assessment by external item writers, staff, and the Learning Area Committee according to detailed specifications set forth in the process by content matrix. Because of the increasing availability and popularity of calculators, NAEP has gathered information about their use by students beginning with the 1977-78 assessment and this practice continued in 1986. A minimal amount of instruction on the use of the calculator is given prior to such items. Also, the items are repeated without the use of calculators in other parts of the assessment to permit comparisons of performance with and without the calculator.

The process and schedule for developing the mathematics items were very similar to those used for reading. At the January 1984 meeting, the Learning Area Committee issued guidelines for designing items, which were carried out by staff and external item writers. The newly developed materials were then subjected to the stringent and multiphased ETS internal review process; the results were reviewed by the committee at its second meeting in the summer of 1984. The committee made revisions and wrote new items, which were subsequently reviewed and prepared for OMB clearance prior to field testing. After field testing, the results were reviewed and the Learning Area Committee recommended trend and newly developed items to be included in the 1986 assessment. These materials were again subjected to the ETS and NAEP review process and eventually submitted for OERI review and OMB clearance prior to being included in the 1986 assessment.

2.8.3 Background and Attitude Questions

In developing materials for the student questions specific to its curriculum area, the Learning Area Committee considered a number of important contexts for learning mathematics. Five categories of attitudinal and background measures were developed: mathematics in school, mathematics and oneself, mathematics and society, mathematics as a discipline, and attitudes toward computers. Additional questions were included to gather information on each student's experience with calculators. These questions covered how often the student had used a calculator, whether the student's family owned one, in what courses the student had used a calculator, and what experiences with calculators the student had had outside of school.

2.9 DEVELOPING THE SCIENCE ASSESSMENT

2.9.1 Objectives

The framework for the 1986 science assessment was developed as a three-dimensional matrix--content by context by cognition. The content dimension included the traditional disciplines of science (life sciences, physics, chemistry, and earth and space sciences) as well as the nature/processes of science and its history. The context dimension defined four types of situations for presenting assessment items: scientific, personal, societal, and technological. The cognitive dimension identified three generic categories required to deal with science at different levels of complexity: knows, uses, and integrates.

The process for developing the science objectives followed the established NAEP pattern. Before the first meeting of the Learning Area Committee, the framework used for the 1976-77 assessment was reviewed by 25 science educators, including teachers, administrators, and scientists. At its January 1984 meeting, the committee discussed these reviews, developed the three-dimensional matrix, identified the major categories within each dimension for assessment, and established categories for student self-reporting of attitude and background information.

The first draft of the objectives was reviewed by 15 practitioners, revised, and reviewed again by about 25 individuals representing a combination of science educators and interested public parties. These reviews were collated for the Learning Area Committee and used to create the final draft of the objectives booklet (see NAEP, 1986b).

2.9.2 Item Development

More than 400 new science items were written by about 35 external item writers according to specifications prepared by NAEP staff. At its second meeting in June 1984, the Learning Area Committee reviewed all items, designating each as acceptable, acceptable with revision, or rejected, and checked the classification of each item according to the matrix. The remainder of the process used to develop items for the 1986 science assessment followed that described earlier for reading and mathematics, consisting of reviews for content, measurement, and sensitivity issues; OMB clearance for field testing; field testing and analysis of those results; a third Learning Area Committee meeting for final selection of trend and newly developed items; ETS and NAEP reviews of final materials; and preparation of materials for OMB clearance prior to their inclusion in the 1986 assessment.

2.9.3 Background and Attitude Questions

In addition to drafting the three-dimensional matrix underlying item development for the 1986 science assessment, the Learning Area Committee spent considerable effort formulating areas that should be covered in collecting information descriptive of students' attitudes, values, and experiences in the area of science. Seven categories of questions for self-reporting by students were defined: attitudes toward science classes, career and education intentions, socioscientific responsibility, science as a personal tool, value of science, societal issues, and experiences in science.

2.9.4 Developing the "Hands-on" Pilot in Mathematics and Science

In conjunction with the discussion on developing materials for the 1986 mathematics and science assessments, it is important to reference NAEP's pilot project to assess higher-order thinking skills in science and mathematics. Well documented in Learning by Doing: A Manual for Teaching and Assessing Higher-Order Thinking in Science and Mathematics (NAEP, 1987b), as well as in the final project report entitled A Pilot Study of Higher-Order Thinking Skills Assessment Techniques in Science and Mathematics (NAEP, 1987c), the purpose of this project was to enhance the development efforts of the mathematics and science assessments. As stressed in the introduction to this section on developing the 1986 assessment materials, the Assessment Policy Committee was very eager, as was the NAEP staff, to measure higher-order thinking skills. However, all of the Learning Area Committees felt the frustration of trying to do so within the constraints of self-administered paper-and-pencil tests.

Thus, the staff solicited and obtained additional funding from the National Science Foundation to prepare and conduct a pilot of assessment administrations involving "hands-on" and computer-administered tasks in science and mathematics. A very exciting and well-received project, this work will be continued in the 1990 science and mathematics assessments.

2.10 DEVELOPING THE COMPUTER COMPETENCE ASSESSMENT

2.10.1 Objectives

Developing the framework for the 1986 computer competence assessment presented a particular challenge to NAEP and the Learning Area Committee. Because this was the first NAEP assessment in this subject area, the committee had to develop the objectives from "scratch." This in and of itself made the task difficult; however, the problem was exacerbated by the nature of instruction and learning in this subject area. Because of the mixture of learning about computers that occurs in and out of school, students at any given grade level can have a wide range of different experiences, and students at higher grade levels do not necessarily have more competence than students at lower grade levels. Finally, the nature of the underlying technology makes the entire field "a moving target."

Due to these anticipated difficulties, the computer competence Learning Area Committee was composed of eight members as compared to five for the other subject areas. In addition, the committee had many more meetings--eight in all--to accomplish its complex tasks of monitoring development of the objectives booklet (NAEP, 1986c) and designing as well as reviewing items. As NAEP procedures dictate, the objectives booklet was also subjected to a wide-ranging review by computer specialists, educators, school administrators, legislators, members of the business community, and parents.

The final objectives were arranged in a framework that included content and cognitive subdivisions. The content domain included computer knowledge (e.g., the history of computing and uses for computer technology), computer applications (e.g., familiarity with the operation and design of applications including word processing, databases, graphics, spreadsheet, and lab instrumentation), and computer science/programming (e.g., knowledge of programming language elements and structure as well as the ability to plan and design programs). The cognitive domain included knowledge, applications, and programming categories, and certain cognitive skills associated with operation, knowledge, and design.

2.10.2 Item Development

For the computer competence assessment, item development was a particularly challenging and frustrating experience. The issue of "the moving target" described above was everpresent. No sooner were prototype items developed than advances in technology made them obsolete. However, to be clear about the items forming the basis of the assessment, the Learning Area Committee included examples in the objectives booklet. A second and primary concern of the committee centered on the limitations imposed by trying to assess students' actual ability using a computer with only paper-and-pencil measures. As with the science and mathematics assessments, additional funds for a "hands-on" assessment were sought from the National Science Foundation. However, in this case--and in retrospect, probably appropriately so--a pilot assessment of this nature was deemed to be premature.

Eventually, with concerted effort by staff, the Learning Area Committee, and external item writers, items were developed for all aspects of the computer competence objectives. After lengthy debate, the programming items developed for grade 3/age 9 and grade 7/age 13 used BASIC and LOGO programming languages, whereas those developed for grade 11/age 17 used BASIC and Pascal programming languages.

2.10.3 Background and Attitude Questions

The student background questions developed for the computer competence assessment focused on two very important issues--attitudes toward computers and access to learning about and using computers. The attitude questions included those on students' confidence in their computing ability; their feelings on the value of knowing about computers later on in school or the workplace; their desire for more challenging computer experiences; and their attitudes toward copyright restrictions, software piracy, and computer ethics. Access questions included those on the availability of computers at home and at school; the various opportunities students may have had to learn about computers; the computer courses taken by students; the programming languages students know; and other general computer-related information.

2.11 DEVELOPING THE U.S. HISTORY AND LITERATURE ASSESSMENTS

2.11.1 Objectives

The NAEP consultants, reviewers, and staff involved with the Foundations of Literacy project (see NAEP, 1986d) agreed that a full assessment of U.S. history not only would include recognition of the facts of our history--the documents, events, and personages that have molded the nation--but also would explore the extent to which students can and do use their knowledge to formulate ideas and concepts, to recognize patterns, and to establish for themselves a connectedness of things. However, having knowledge about the variety of topics that form the basis of dialogue and information-sharing is central to literacy, and the U.S. history Learning Area Committee began the process of describing some fundamentals. Although care was taken to address topics relevant to political history, women's history, Black history, labor history, technology, geographies, immigration, and foreign policy, the assessment topics were arranged chronologically for the convenience of ordering the material. Seven relatively arbitrary periods of history were outlined: Exploration and Colonization: Up to 1763; the Revolutionary War and the New Republic: 1763-1815; Nationhood, Sectionalism, and the Civil War: 1815-1877; Territorial Expansion, the Rise of Modern America, and World War I: 1877-1920; the Great Depression, the New Deal, and World War II: 1920-1945; and Post-World War II: 1945 to Present.

In outlining the topics for the literature assessment, the Learning Area Committee felt that students should be familiar with characters who have become symbols of our humanity; with authors and works that are representative of major genres, themes, and movements; and with familiar quotations from poems, plays, speeches, and documents. These characters, authors, works, themes, and quotations were drawn from a wide variety of literature, including classical as well as modern works, world literature in addition to American and English literature, and children's classics. The genres included: novels, short stories, and plays; myths, epics, and biblical stories; poetry; and nonfiction.

Developing the materials for the Foundations of Literacy project started nearly one year later than the efforts for the other four subject areas comprising the 1986 assessment. However, given that the assessment topics were confined to the knowledge area by the nature of the grant and the assessments were only given to one grade/age level (17-year-olds and 11th graders), it was not infeasible to work within such a compressed schedule.

2.11.2 Item Development

A 10-member Learning Area Committee was selected by NAEP staff and by the Foundations of Literacy project directors from the Education Excellence Network, Chester Finn and Diane Ravitch. Comprising five specialists in U.S. history and five in literature, the committee met three times during the period from November 1984 through June 1985. Although items were written by NAEP and ETS staff, the committee reviewed all items carefully and wrote many new ones. They reviewed the items and prepared them for field testing at their second meeting, and reviewed the results of the field test at their third meeting.

2.11.3 Background and Attitude Questions

The U.S. history and literature Learning Area Committees were primarily concerned with gathering information about students' instructional experiences. In addition, for U.S. history, there was particular concern that high-school history courses are generally taught chronologically and that students rarely study the 20th century. Thus, questions were designed to see if students had studied the time periods assessed. For literature, there was particular concern that students are not assigned much reading in school and that what literature is assigned is quite diverse in scope. Thus, in designing the background questions for literature, a particular attempt was made to collect information about students' experience with basic literary works and their reading habits.

2.12 DEVELOPING THE COMMON CORE STUDENT QUESTIONS AND QUESTIONNAIRES

Five additional instruments were developed for the 1986 assessment: a common core of student background questions, a teacher questionnaire, a computer coordinator questionnaire, a school characteristics and policies questionnaire, and an excluded student questionnaire.

The student, teacher, and school instruments were designed to collect information about home, classroom, and school factors related to eight policy issues that were the focus of the 1986 assessment: teacher quality; principal as instructional leader; school standards and policies; school environment conducive for education; meeting special needs; effective classroom practices; student's school experiences and attitudes; and home environment supportive of education.

The development of policy issues and items was an iterative process that involved staff work, field testing, periodic review by an external advisory group, and review by the Assessment Policy Committee. An initial, longer list of policy issues was developed by NAEP staff based on a review of current policy research and related literature. Of particular interest were the school effectiveness research, the push for raising educational standards, and parents' involvement in their children's education. Items were developed to assess the policy issues and field tested with students, teachers, and principals. The policy issues, items, and field test results were reviewed by a group of policy researchers, which recommended a consolidated list of policy issues and identified specific items to be included in the final questionnaires. The field test results and the recommendations of the consultants were also reviewed by the Assessment Policy Committee. The items were then assembled into questionnaires and submitted to internal ETS procedures to ensure fairness and quality.

Every student booklet began with a common core of background questions. In many cases the questions used in 1986 were taken from prior assessments.

Some of the newly developed questions focused on mathematics, science, and computer instruction and others on parental involvement in the child's education. Although many of the questions were common to the three grade/age levels assessed, some were specifically targeted to elementary or high-school students. At grade 3/age 9, the background questions were read aloud to the students and took approximately 15 minutes to complete. At the other two grade/age levels, students read and answered the questions on their own during a six-minute time period. At these grade/age levels, the questions asked about demographics, home environment, and instruction experiences.

The teacher questionnaire was given to a sample of the students' teachers, and took approximately 20 minutes to complete. The major part of the questionnaire included general questions about demographics, training, experience and classroom management strategies, while the remaining part included questions specific to reading/language arts and English, mathematics, science, and, at grade 11/age 17, U.S. history. At grade 3/age 9, the questionnaire was given to a sample of the students' reading/language arts teachers. However, it was assumed that in most cases these teachers also taught other subject areas, so the questionnaire included general questions plus questions about reading, mathematics and science instruction. At the other grade/age levels, participating schools were randomly designated as reading, mathematics, science, or (at grade 11/age 17 only) U.S. history schools, and questionnaires were given to a sample of the students' teachers in that subject area. The questionnaire included a general section and several subject-specific sections, and teachers were directed to fill out the appropriate sections.

The computer coordinator questionnaire was administered to the person in each participating school who coordinated computer instruction in the school. The questionnaire include questions about the coordinator's background, training, and experience and about the types of computer instruction that were present in the school. If a school did not have anyone who acted in this role, the questionnaire was not administered.

The school characteristics and policies questionnaire was given to the principal in each participating school, and took about 15 minutes to complete. The questions asked about the principal's background and experience and about school policies, programs, facilities, as well as the composition and background of the student body.

The excluded student questionnaire was given to the teachers of students who were identified in the NAEP sample but were excluded from the assessment for some reason, usually because the student was handicapped or had limited English proficiency. This questionnaire took approximately three minutes per student to complete and asked about the nature of the student's exclusion and special programs in which the student participated.

2.13 FIELD TESTS FOR THE 1986 ASSESSMENT

In February 1985, field testing commenced for the 1986 assessments of reading, mathematics, science, computer competence, U.S. history, and literature, and for the teacher and school administrator questionnaires described previously.

The first part of the field test covered reading, mathematics, science, and computer competence. A total of nine booklets was developed for grade 3/age 9, each containing three blocks of items. In all, five reading blocks, eight mathematics blocks, eight science blocks, and six computer competence blocks were field tested for this grade/age. The analysis of results from the grade 3/age 9 field test revealed that some of the item formats were problematic for these students; therefore, a second field test was later conducted at this grade/age level to evaluate revised item formats.

For grade 7/age 13, 12 booklets were developed for the field test, containing three blocks each. A total of five reading blocks, nine mathematics blocks, 10 science blocks, and 12 computer competence blocks was field tested for this grade/age. Thirteen booklets, each containing three blocks, were created for the grade 11/age 17 field test; these booklets contained a total of five reading blocks, 10 mathematics blocks, 12 science blocks, and 12 computer competence blocks.

Each block of mathematics, science, reading, and computer competence items contained two minutes of subject-specific background/attitude items and 14 minutes of cognitive items, as well as two minutes of general background items. Thus, each booklet contained a total of approximately 48 minutes of assessment material.

The second part of the field test covered U.S. history and literature items for grade 11/age 17 only. Three booklets were created for each of these subjects, each containing three blocks. Each booklet contained approximately six minutes of background items and 48 minutes of cognitive items.

From February through May 1985, trained NAEP and ETS staff conducted field tests for the reading, mathematics, science, computer competence, U.S. history, and literature items in 285 classrooms, representing an estimated 7,550 students from 61 school districts. In addition, 94 school officials and 272 classroom teachers were asked to complete the school and teacher questionnaires. The set of schools represents a purposive national sample, consisting of medium-sized cities, small places, and disadvantaged urban areas of large cities in the country's four geographical regions. Field test sites were selected and solicited for participation by NAEP staff. Within each selected site, school personnel identified the 3rd-, 7th-, and 11th-grade students to be surveyed.

The field test data were scored and analyzed from March to May 1985. Using interleaved item analysis, which provides the mean percentage of correct responses for each item in the field test, NAEP staff and consultants reviewed the materials according to five purposes: to determine which items were most related to achievement in the four subject areas; to evaluate the effectiveness of items designed specifically to assess higher-order thinking skills; to determine necessary revisions to items that lacked clarity, or to ineffective item formats; to prioritize items to be included in the full assessment; and to determine appropriate timing for assessment items.

Reviews of field test items were conducted by NAEP and ETS staff, the Learning Area Committee, and external consultants; through this process, items were selected for the 1986 assessment. A final clearance package containing these items was submitted to OMB in July 1985.

2.14 FINAL PREPARATION OF THE 1986 ASSESSMENT MATERIALS

2.14.1 Objectives Booklets

After consensus review and approval by each Learning Area Committee, the objective booklets were sent to OERI for the internal government and peer review process. Subsequent to that 30-day review and incorporation of suggested revisions, the booklets were submitted to ETS internal editing and finally to the composition and printing process. The four objectives booklets (reading, mathematics, science, and computer competence) as well as the description booklet for the Foundations of Literacy project--the U.S. history and literature assessments--were published and released in 1986.

2.14.2 Student Assessment Booklets and Questionnaires

The items earmarked by each Learning Area Committee and submitted to OMB clearance for inclusion in the 1986 assessment were assembled into blocks in accordance with the assessment design. These blocks were assembled to meet committee content, context, and cognition specifications and to conform to the assessment time and administration restrictions. Approximately two minutes of subject-matter relevant background questions appeared at the start of most blocks, followed by the cognitive items. Specifically, for reading, six item blocks were prepared for assessment at each grade/age level; for mathematics and science, seven item blocks were prepared for grade 3/age 9, nine for grade 7/age 13, and 11 for grade 11/age 17; and for computer competence, three item blocks were prepared at grade 3/age 9 and six item blocks were prepared for each of the two older grade/age levels. Similarly, the questions for school administrators, teachers, and about excluded students were assembled into questionnaires.

The assessment blocks and questionnaires were subjected to the review process established by ETS and NAEP, including scrutiny by subject-matter specialists, measurement specialists, test editors, and persons specially trained to review questions for any potential sensitivity concerning women or minority groups. As part of the OMB clearance process, all items were also reviewed by OERI staff, by the Office for Quality Assurance and by the Office for Management and Budget. Subsequent to the complete review process, the blocks and questionnaires were submitted for composition, printing, bundling, and distribution to the Westat, Inc., field staff responsible for administering the 1986 assessment.

2.15 1986 ASSESSMENT DEVELOPMENT CONSULTANTS

Reading Learning Area Committee

Naomi Gordon, Public Schools of Brookline, Lexington, MA
Judith Langer, University of California, Berkeley, CA
Dorothy Strickland, Columbia University, New York, NY
Robert Tierney, University of Illinois, Champagne-Urbana, IL
Richard Venezky, University of Delaware, Newark, DE

Reading Item Development Consultants

Jo Beth Allen, Kansas State University, Manhattan, KS
Arthur Applebee, National Council of Teachers of English, Urbana, IL
Michael Axline, University of Oregon, Eugene, OR
Fernie Baca, University of Colorado, Denver, CO
Richard Beach, University of Minnesota, Minneapolis, MN
Barbara Bianchi, Paideia School, Atlanta, GA
Susan Blank, Manpower Demonstration Research Corporation, Brooklyn, NY
Robin Butterfield, Northwest Regional Educational Laboratory, Portland, OR
Robert Calfee, Stanford University, Stanford, CA
Jeanne Chall, Harvard Graduate School of Education, Cambridge, MA
Carita Chapman, Chicago Public Schools, Chicago, IL
Ruth Coleman, North Side High School Mothers Alumni Club, Fort Wayne, IN
Christopher Connell, Associated Press, Washington, DC
Larry Coon, McDonald's Restaurants, Henderson, TX
Bernice Cullinan, New York University, New York, NY
Mary E. Curtis, Harvard Graduate School of Education, Cambridge, MA
Jacqueline Danzberger, Youthwork Inc., Arlington, VA
Martha Darling, Washington Roundtable Education Study, Bellevue, WA
Philip DiStefano, University of Colorado, Boulder, CO
Terry Dozier, South Carolina State Department of Education, Columbia, SC
Priscilla Drum, University of California at Santa Barbara, Santa Barbara, CA
William Eller, State University of New York at Buffalo, Amherst, NY
Leo Estrada, University of California, Los Angeles, CA
Claryce Evans, Boston Public Schools, Boston, MA
Marjorie Farmer, School District of Philadelphia, Philadelphia, PA
Roger Farr, University of Indiana, Bloomington, IN
Edmund Farrell, University of Texas, Austin, TX
Edward Fry, Rutgers University, New Brunswick, NJ
Carol Gibson, National Urban League, New York, NY
Kenneth Goodman, University of Arizona, Tucson, AZ
Donald Graves, University of New Hampshire, Durham, NH
Jean Greenlaw, North Texas State University, Denton, TX
Doris Hankins, Germantown High School, Germantown, TN
Jerome Harste, University of Indiana, Bloomington, IN
David Hayes, University of Georgia, Athens, GA
Paul Heffernan, Star Market, Newtonville, MA
Harold Herber, Syracuse University, Syracuse, NY
Jane Holt, Champlain Valley Union High School, Hinesburg, VT

Shu-in Huang, City of Thornton, Thornton, CO
Evaline Khayat Kruse, Audubon Junior High School, Los Angeles, CA
Diane Lapp, Boston University, Boston, MA
Herbert J. Lapp, Jr., GPU Nuclear Corporation, Parsippany, NJ
Ron Lessnau, Hamburger University, Oakbrook, IL
Ray Marshall, University of Texas, Austin TX
Phyllis A. Miller, Reading Development Seminars, Minneapolis, MN
Charles Moody, University of Michigan, National Alliance of Black School Educators, Ann Arbor, MI
Peter Mosenthal, Syracuse University, Syracuse, NY
Edwin Newman, NBC News, New York, NY
Pedro Pedraza Jr., Hunter College, New York, NY
Anthony Petrosky, University of Pittsburgh, Pittsburgh, PA
Carolyn N. Pinckney, Bunker Hill Elementary School, Washington, DC
Carolyn Pollan, State of Arkansas, Fort Smith, AR
Walter L. Powers, School District #271, Coeur d'Alene, ID
John Readance, Louisiana State University, Baton Rouge, LA
Beverly Roller, Jefferson County Public Schools, Littleton, CO
Glenn E. Rotz, Highland Elementary School, Clarkson, WA
Sarah Saint-Onge, Godine Publishing Co., Boston, MA
Adan C. Salgado, Johnston High School, Austin, TX
S. Jay Samuels, University of Minnesota, Minneapolis, MN
Robert Schreiner, University of Minnesota, Minneapolis, MN
John Stewig, University of Wisconsin, Milwaukee, WI
Jaap Tuinman, Simon Fraser University, Burnaby, B.C., Canada
Janet Tully, Marriott Corporation, Washington, DC
Richard Vacca, Kent State University, Kent, OH
Rod Vahl, Central High School, Davenport, IA
Sheila Valencia, University of Colorado, Boulder CO
Thomas Vallejos, University of Colorado, Boulder, CO
Maria Watkins, University of Pennsylvania, Graduate School of Education, Philadelphia, PA
Rick Wetherell, North Bend High School, West Bend, OR
Susan M. Wolf, The Hastings Center, Hastings-on-Hudson, NY
Kathy Yen, San Francisco Public Schools, San Franciso, CA
Seymour Yesner, Brookline High School, Brookline, MA

Mathematics Learning Area Committee

James Bruni, Herbert H. Lehman College, Bronx, NY
Iris M. Carl, Houston Independent School District, Houston, TX
Clyde L. Corcoran, California High School, Whittier, CA
F. Joe Crosswhite, The Ohio State University, Columbus, OH
Shirley Hill, University of Missouri-Kansas City, Kansas City, MO

Mathematics Consultants

Joan L. Akers, San Diego County Office of Education, San Diego, CA
Rudy B. Beede, Forrest City Middle School, Forrest City, AR
Elaine Bologna, Summit School, Winston-Salem, NC

Olympia E. Boucree, New Orleans Public Schools, New Orleans, LA
Donna Kay Buck, Washington-Hoyt Schools, Tacoma, WA
Ernestine Capehart, West Virginia Department of Education, Charleston, WV
Thomas P. Carpenter, University of Wisconsin, Madison, WI
Mary Kay Corbitt, Louisiana State University, Baton Rouge, LA
Gilbert J. Cuevas, University of Miami, Miami, FL
Edgar L. Edwards, Jr., Virginia State Department of Education, Richmond, VA
Carolyn K. Ehr, Fort Hays State University, Hays, KS
James Fey, University of Maryland, College Park, MD
Carole Greenes, Boston University, Boston, MA
Marilyn L. Hala, South Dakota Department of Education, Pierre, SD
Jerry Jean Hale, Southmoor Elementary School, Denver, CO
Norma G. Hernandez, University of Texas, El Paso, Tx
Patricia M. Hess, Albuquerque Public Schools, Albuquerque, NM
Vernon R. Hood, Portland Community College, Portland, OR
Larry Johnson, Clarke County Schools, Athens, GA
Mary Grace Kantowski, University of Florida, Gainesville, FL
Robert Kenney, Vermont Department of Education, Montpelier, VT
Genevieve M. Knight, Coppin State College, Baltimore, MD
Katherine P. Layton, Beverly Hills High School, Beverly Hills, CA
John LeBlanc, University of Indiana, Bloomington, IN
Gordon Lewis, District of Columbia Public Schools, Washington, DC
Betty K. Lichtenberg, University of South Florida, Tampa, FL
Mary M. Lindquist, Columbus College, Columbus, GA
Mary Martin, Lawrence School, Brookline, MA
William D. McKillip, University of Georgia, Athens, GA
James A. Nelson, Simmons Junior High School, Aberdeen, SD
Phares G. O'Daffer, Illinois State University, Normal, IL
Joseph N. Payne, University of Michigan, Ann Arbor, MI
Norma J. Reed, Douglas Smith Elementary School, Alief, TX
Robert Reys, University of Missouri, Columbia, MO
Joyce Scalzitti, Summit Junior High School, Paterson, NJ
Bernie Richard Schnorenberg, Sundance Junior-Senior High School, Sundance, WV
Helene Silverman, Herbert H. Lehman College, Bronx, NY
Louise M. Smith, Charleston County Schools, Charleston, SC
William A. Stannard, Eastern Montana College, Billings, MT
Jacquelyn M. Stonebraker, Evergreen Junior High School, Salt Lake City, UT
Marilyn N. Suydam, The Ohio State University, Columbus, OH
Jane Swafford, Northern Michigan University, Marquette, MI
B. Ross Taylor, Minneapolis Public Schools, Minneapolis, MN
Alexander Tobin, The School District of Philadelphia, Philadelphia, PA
Kenneth J. Travers, University of Illinois, Champaign, IL
Gloria H. Tuggle, Memphis City Schools, Memphis, TN
Charlene E. West, Cajon Valley School District, El Cajon, CA
Elizabeth M. Whitaker, Lee Resource Center, Tucson, AZ
Steven S. Willoughby, New York University, New York, NY
James W. Wilson, University of Georgia, Athens, GA
Marcelline Richard Zambuco, John F. Deering Junior High School, Warwick, RI
Marilyn Zweng, University of Iowa, Iowa City, IA

Science Learning Area Committee

Audrey Champagne, American Association for the Advancement of Science, Washington, DC
George Kieffer, University of Illinois, Urbana, IL
Nuria Rodriguez, Beverly Hills High School, Beverly Hills, CA
Calvin VanderWerf, University of Florida, Gainesville, FL
Wayne Welch, University of Minnesota, Minneapolis, MN

Science Consultants

Don Ahshapanek, Haskell Indian Junior College, Lawrence, KS
Dale R. Baker, University of Utah, Salt Lake City, UT
Paul Bamberg, Harvard University, Cambridge, MA
Gail Barcelo, Board of Education, South Brunswick, NJ
Ron Barnes, Office of Science, Baltimore County School District, Baltimore, MD
William E. Barstow, University of Georgia, Athens, GA
Linda Behrens, Perry Hall Middle School, Baltimore, MD
Jack Bouma, Pikesville Middle School, Baltimore, MD
Marilyn Braveman, American Jewish Committee, New York, NY
Linda Broach, Mountainbrook Jr. High School, Birmingham, AL
John R. Brown, Jr., Trustee, Kean College of NJ, Short Hills, NJ
William S. Dougall, Lakeside School, Seattle, WA
Kenneth W. Dowling, Wisocnsin Department of Public Instruction, Madison, WI
Beulah Durr, Nottingham High School, Syracuse, NY
Vera King Farris, Richard Stockton State College, Pomona, NJ
Louis Finsand, Malcolm Price Laboratory School, University of Northern Iowa Cedar Falls, IA
Joseph M. Flynn, Citizen's Council for Ohio Schools, Cleveland, OH
Anthony Galitsis, N.Y.C. Board of Education, Brooklyn, NY
Roy A. Gallant, University of Southern Maine, Portland, ME
Beverly German, Shady Spring Elementary School, Baltimore, MD
Reen Gibb, Brookline High School, Brookline, MA
Dennis Gray, Council for Basic Education, Washington, DC
Martha Green, Florida Department of Education, Tallahassee, FL
Laura Hallowell, Wellesley High School, Wellesley, MA
John Harkness, Wausau West High School, Wausau, WI
Charles J. Hemenway, St. Paul's Episcopal School, New Orleans, LA
Dale T. Hesser, North Syracuse School District, North Syracuse, NY
Vincent Hollis, Howard University, Washington, DC
Ann C. Howe, North Carolina State University, Raleigh, NC
Cindy Hrebar, Jefferson County School District, Lakewood, CO
Ken Indek, University of Illinois, Champaign, IL
Bernard H. Johnson, Central State University, Wilberforce, OH
Russ Jones, Sussex Elementary School, Baltimore, MD
Maryanne Kalin, Francis W. Parker School, Chicago, IL
James Kelly, Malcolm Price Laboratory School, University of Northern Iowa, Cedar Falls, IA
Leopold E. Klopfer, University of Pittsburgh, Pittsburgh, PA
Sylvia Kramer, Women's Action Alliance, New York, NY

Karl Kranz, National Zoo, Washington, DC
Charles Kuzminski, Hopewell Valley Regional School District, Pennington, NJ
Terry Kwan, Houghton-Mifflin Reference Division, Boston, MA
Jeanne Liu, South Carolina Department of Education, Columbia, SC
Steven Maltese, Charlesmont Elementary School, Baltimore, MD
Phyllis Marcuccio, National Science Teachers Association, Washington, DC
George F. Matthias, Croton-Harmon Senior High School, Croton-on-Hudson, NY
Alan J. McCormick, Laramie, WY
John McGeehee, Rolling Hills High School, Rolling Hills Estates, CA
Thomas McGuire, Briarcliff High School, Briarcliff Manor, NY
Robert McNeesh, Baltimore County Public Schools, Towson, MD
Kenneth Mechling, Clarion University, Clarion, PA
James Mecklenburger, National School Boards Association, Alexandria, VA
Ida M. Medlem, Bellaire High School, Bellaire, TX
Suzanne Mittenthal, University of Illinois, Urbana, IL
Pat Morris, University of Illinois, Champaign, IL
Patsy Mueller, Highland Park High School, Highland Park, IL
John Murphy, Board of Education, Howard County Public Schools System, MD
Joseph Novak, Cornell University, Ithaca, NY
Linda Parker, Department of Education, Tallahassee, FL
George Patrinicola, Loch Raven Senior High School, Baltimore, MD
Nadine Peterson, Oak Park and River Forest High School, Oak Park, IL
Michael D. Piburn, Salt Lake City, UT
Frank Quagliano, Macintosh Middle School, Sarasota, FL
Senta Raizen, National Academy of Science, Washington, DC
Thomas R. Richardson, University School of Milwaukee, Milwaukee, WI
Joseph Riley, Michigan Department of Education, Lansing, MI
David Robinson, Albany State College, Albany, GA
James T. Robinson, Boulder Valley Schools, Boulder, CO
Eloy Rodriguez, University of California, Irvine, CA
Mary Budd Rowe, University of Florida, Gainesville, FL
Loren E. Sanchez, Upland School District, Upland, GA
Walter Scheider, Huron High School, Ann Arbor, MI
Byron M. Shinn, McClure Jr. High School, Western Springs, IL
Robert Sigda, National Science Teachers Association, Dix Hills, NY
Mary Lou Simon, South Brusnwick Schools, Monmouth Junction, NJ
Marilyn Smith, Beverly Vista School, Beverly Hills, CA
Nancy Spaulding, Elmira Free Academy, Elmira, NY
Frances Stivers, Terry Park High School, Jacksonville, FL
Anita Stockton, Perry Hall Senior High School, Baltimore, MD
Zack Taylor, Consultant, Science Education Unit, Sacramento, CA
Leigh VenEtten, Charles Wright Academy, Tacoma, WA
Muriel Vaughn, National Black Child Development Institute, Washington, DC
Henry Walberg, University of Illinois at Chicago, Chicago, IL
Henry Walbesser, University of Maryland, Catonsville, MD
Millie Waterman, Ohio Education Commission, Mentor, OH
Gerald F. Wheeler, Montana State University, Bozeman, MT
Cheryl Williams, American Association of University Women, Washington, DC
Robert E. Yager, University of Iowa, Iowa City, IA
Judith Yero, University of Illinois, Champagne, IL
Lawrence J. Zambrowski, Churchill Jr. High School, East Brunswick, NJ
Veronica Zepeda, Arizona State Department of Education, Phoenix, AZ

Computer Competence Learning Area Committee

Marc S. Tucker (Chairman), Carnegie Forum on Education and the Economy, Washington, DC
Harold Abelson, Massachusetts Institute of Technology, Cambridge, MA
Sharon Burrowes, Wooster Public Schools, Wooster, OH
Eugene Galanter, Columbia University, New York, NY
Vinetta Jones, University of North Carolina, Chapel Hill, NC
Arthur Luehrmann, Computer Literacy, Berkeley, CA
Michelle Rohr, Houston Public Schools, Houston, TX
Joyce Tobias, Brookline Public Schools, Lexington, MA

Computer Competence Analysis Committee

Marcia Linn, University of California at Berkeley, Berkeley, CA
Art Luernman, Computer Literacy, Berkeley, CA
Nicholas Petreley, Counterpoint, Trenton, NJ
Michelle Rohr, Houston Public Schools, Houston, TX
Bob Vivens, Princeton High School, Princeton, NJ

Computer Competence Reviewers

Leon Adkison, Taylor University, Upland, IN
John Aiken, The Evergreen State College, Olympia, WA
Judy Anderson E., Consolidated School, St. Paul, MN
Edward Asmus, State University of New York at Buffalo, Buffalo, NY
Margaret Asprey, David Systems, Inc., Sunnyvale, CA
Richard Austing, University of Maryland, College Park, MD
George Bass, Jr., College of William and Mary, Williamsburg, VA
Henry Jay Becker, Johns Hopkins University, Baltimore, MD
Frank Besag, University of Wisconsin, Milwaukee, WI
Karen Billings, Houghton Mifflin, Boston, MA
Gary Bitter, Arizona State University, Tempe, AZ
Susan Brinkman, National PTA, Chicago, IL
Hugh Cobb, Consultant, Denver, CO
William W. Crandall, Princeton University, Princeton, NJ
Enrique Cubillos, Washington, D.C. Public Schools, Washington, DC
John DeGilio, Vassar College, Poughkeepsie, NY
Tim Ellard, Opinion Research Corporation, San Francisco, CA
Gail Feldman, Parent, Braintree, MA
Robert Feldman, Parent, Braintree, MA
Mark Fetler, California State Dept. of Education, Sacramento, CA
LeRoy Finkel, San Mateo County Office of Education, Redwood City, Ca
Glen Fisher, Computer Using Educators, San Jose, CA
Steven M. Frankel, Montgomery County Public Schools, Rockville, MD
Susan Friel, Lesley College, Cambridge, MA
Beverly Hagy, Trenton J.H.S. #5, Trenton, NJ
Sally Hansen, Mercer County Community College, Trenton, NJ

Dennis Hartzler, Oak Street Elementary School, Orville, OH
Marge Hohly, Downey High School, Long Beach, CA
Beverly Hunter, Targeted Learning Corporation, Amissville, VA
Elois Irvin, J.F. Kennedy High School, Richmond, CA
Robert B. Jensen, Farmbank, Inc. Aurora, CO
Scott Johnson, High School for the Engineering Professions, Houston, TX
Dan Kauffman, Florida Atlantic University, Boca Raton, FL
Bette Kindman-Koffler, Mathematica, Inc., Princeton Junction, NJ
Charlotte Kuh, AT&T, Short Hills, NJ
Rafael Ledesma, St. Joseph of the Palisades High School, West New York, NJ
Peter Lenkway, Department of Education, Tallahassee, FL
Thomas Lough, Piedmont Community College, Charlottesville, VA
Michael S. Mahoney, Princeton University, Princeton, NJ
David Martin, Jericho High School, Jericho, Long Island, NY
Mara Mayor, Annenberg - CPB Project, Washington, DC
Diane McEntyre, Mills College, Berkeley, CA
John McManus, Pepperdine University, Manhattan Beach, CA
Patty Mitchell, National Assoc. of State Boards of Education, Alexandria, VA
Michael Moshell, University of Tennessee, Knoxville, TN
David Moursund, University of Oregon, Eugene, OR
Adeline Naiman, HRM Software, Cambridge, MA
Robert Peebles, Superintendent of Schools, Alexandria, VA
Robert Perry, Santa Monica High School, Santa Monica, CA
Stan Pogrow, University of Arizona, Tucson, AZ
James Poirot, North Texas State University, Denton, TX
Ruth Randall, Minnesota Department of Education, Apple Valley, MN
Jean Rice, Computer Education Consultant, Minneapolis, MN
Ellen Richman, Chagrin Falls Public Schools, Morland Hills, OH
Dick Ricketts, University of Oregon, Eugene, OR
Boots Riebling, St.Thomas Aquinas High School, Wilton Manor, FL
David C. Rine, Western Illinois University, Macomb, IL
Linda Roberts, Congress of the U.S., Washington, DC
Jean Rogers, University of Texas, Austin, TX
Randolph Ross, Newtown High School, Elmhurst, NY
Nola Sheffer, Hanscom Primary School, Hanscom, AFB, MA
Joy Silver, Congressional Aide, Washington, DC
Twila Slesnick, Classroom Computer Learning, Belmont, CA
Sally Sloan, Minneapolis Public Schools, North Oaks, MN
Elliot Soloway, Yale University, New Haven, CT
Joan Targ, Interactive Sciences, Palo Alto, CA
Robert Taylor, Teacher's College, New York, NY
Robert F. Tinker, Technical Education Research Centers, Inc., West Concord, MA
Decker Walker, Stanford University, Stanford, CA
Linda Weinert, Versatech Inc., Santa Clara, CA
Judy Weisenberger, The Ohrenberger School, West Roxbury, MA
Leslie Wolfe, National Organization for Women LDEF, Washington, DC

History Learning Area Committee

Diane Brooks, California State Department of Education, Sacramento, CA
Henry N. Drewry, Princeton University, Princeton, NJ
Dana Kurfman, Prince Georges County Public Schools, Landover, MD
Donald V. Rogan, New Trier High School, Evanston, IL
Stephan Thernstrom, Harvard University, Cambridge, MA

History Reviewers

Ron Adams, Kingswood Regional High School, Wolfeboro, NH
William J. Alexander, Hillsboro High School, Hillsboro, OH
Donald Bragaw, New York Bureau of Social Studies Education, Albany, NY
Francis L. Broderick, University of Massachusetts, Boston, MA
Nancy I. Brown, Mississippi State Department of Education, Jackson, MS
David Burner, SUNY at Stony Brook, Stony Brook, NY
R. Freeman Butts, Hoover Institution, Stanford, CA
Mary Butz, Edward R. Murrow High School, Brooklyn, NY
Catherine Cannon, Eau Claire High School, Columbia, SC
William B. Catton, Historian, Lancaster, PA
Carole Chaet, Cambridge Rindge and Latin School, Cambridge, MA
John M. Chapman, Michigan Department of Education, Lansing, MI
Paul K. Conkin, Vanderbilt University, Nashville, TN
Ann L. Cotton, Fort Worth Public Schools, Fort Worth, TX
Henry F. Cotton, Cherry Creek High School, Englewood, CO
Jean Craven, Albuquerque Public Schools, Albuquerque, NM
Neil Cross, Social Studies Consultant, Lincoln, NE
Gerald Danzer, University of Illinois, Itasca, IL
Deborah Drucker, National Council for the Social Studies, Washington, DC
Catherine W. Edwards, Boulder Valley Public Schools, Boulder, CO
Hugh D. Graham, University of Maryland, Catonsville, MD
Kermit L. Hall, University of Florida, Gainesville, FL
Patricia Harris, Gary Public Schools, Gary, IN
Richard Huntington, Columbia High School, Maplewood, NJ
Jean Hutt, Saline Area Schools, Saline, MI
Thomas Kay, Wheaton College, Wheaton, IL
Clair W. Keller, Iowa State University, Ames, IA
Ralph Ketcham, Syracuse University, Syracuse, NY
Everett Kline, Columbia High School, Maplewood, NJ
David Laudenschlager, Rapid City Central High School, Rapid City, SD
Glenn Linden, Southern Methodist University, Dallas, TX
Herbert I. London, New York University, New York, NY
William Longton, University of Toledo, Toledo, OH
David L. Manning, Conard High School, Meriden, CT
Myron Marty, Drake University, Des Moines, IA
John McCardell, Middlebury College, Middlebury, VT
Fay Metcalf, Boulder Valley Public Schools, Boulder, CO
S. Rex Morrow, Eastern Kentucky University, Richmond, KY
Leo Padalino, Long Beach High School, Lido Beach, NY
Arthur Pease, Lebanon High School, Lebanon, NH
Doug Phillips, Anchorage School District, Anchorage, AK

Helen W. Richardson, Fulton County Board of Education, Atlanta, GA
C. Frederick Risinger, Indiana University, Bloomington, IN
Francisco A. Rosales, Arizona State University, Tempe, AZ
Geraldine H. Rosenthal, Tulsa Public Schools, Tulsa, OK
John Rossi, California State Social Studies Council, Berkeley, CA
Valerie Seaberg, Department of Maine Education, Damariscotta, ME
Gloria Sesso, Half Hollow Hills CSD, Port Jefferson, NY
Theodore Sharp, Falmouth Public Schools, Falmouth, ME
Denny Shillings, Homewood Flossmore Community High School Flossmore, IL
Ted Sizer, Brown University, Providence, RI
Victor A. Smith, Indianapolis Public Schools, Indianapolis, IN
Arthur E. Soderlind, Connecticut State Department of Education, Weatogue, CT
Joyce L. Stevos, Providence Public Schools, Providence, RI
Larry Strickland, Olympia School District, Olympia, WA
Betty Waugh, West Mesa High School, Albuquerque, NM
Walter Weare, University of Wisconsin-Milwaukee, Milwaukee, WI
Richard H. Wilson, Montgomery County Public Schools, Rockville, MD
Judith S. Wooster, New York State Education Department, Albany, NY

Literature Learning Area Committee

E. D. Hirsch, University of Virginia, Charlottesville, VA
Anna K. Johnston, Colchester High School, Colchester, VT
Helen Lojek, Boise State University, Boise, ID
Richard Rodriguez, Author, San Francisco, CA
Patrick Welch, T.C. Williams High School, Arlington, VA

Literature Reviewers

Elizabeth Ackley, Indian Hill High School, Cincinnati, OH
Mark S. Auburn, University of Arkansas, Fayetteville, AR
Richard Barksdale, University of Illinois, Urbana, IL
Kathleen Bell, University of Miami, Miami, FL
Rexford Brown, Education Commission of the States, Denver, CO
Helen Browne, Cold Spring Harbor School, Syosset, NY
Gay Cannavo, Benjamin Cardozo High School, Queens, NY
Carlota Cardenas de Dwyer, Clark High School, San Antonio, TX
Jane Christensen, National Council of Teachers of English, Urbana, IL
Louise A. Cobb, Louisiana Department of Education, Baton Rouge, LA
Scott Colley, Vanderbilt University, Nashville, TN
Bernice Cullinan, New York University, New York, NY
Edmund Farrell, University of Texas, Austin, TX
William Gifford, Vassar College, Poughkeepsie, NY
Roseann Gonzalez, University of Arizona, Tucson, AZ
Judith Greenwald, New Jersey Department of Education, Trenton, NJ
Jan Guffin, North Central High School, Indianapolis, IN
Mary Alice Gunter, University of Virginia, Charlottesville, VA
Eric E. Hoem, Mount Hood Community College, Gresham, OR
Susan Holt, State Department of Education, Cheyenne, WY
James F. Kilroy, Tulane University, New Orleans, LA

Ben Ladner, National Humanities Faculty, Atlanta, GA
Henry Maloney, Seaholm High School, Birmingham, MI
Donald Offerman, River Forest High School, Oak Park, IL
Lee Galda Pellegrini, University of Georgia, Athens, GA
Claire Pelton, Los Altos High School, Los Altos, CA
Jesse Perry, San Diego Public Schools, San Diego, CA
John K. Pickering, Germantown Academy, Fort Washington, PA
Alan Purves, University of Illinois, Urbana, IL
Margaret Reed, Minneapolis Public Schools, Minneapolis, MN
Paul J. F. Regnier, New York State Education Department, Albany, NY
Doris Roettger, Heartland Education Agency, Ankeny, IA
Robert Squires, Oneonta High School, Oneonta, NY
Glays Veidemanis, North High School, Oshkosh, WI
Patricia Wasley, Educational Service District #112, Vancouver, WA
Natalie White, Lincoln High School, Dallas, TX
Marjorie Willis, Midlothian High School, Midlothian, VA
Brooke Workman, West High School, Iowa City, IA
Seymour Yesner, Brookline High School, Brookline, MA

Common Core Student Background Questions and Questionnaires

Valeria Ford, D.C. Public Schools, Washington, DC
Susan Fuhrman, Rutgers University, New Brunswick, NJ
Barbara Heyns, New York University, New York, NY
Nancy Karweit, Johns Hopkins University, Baltimore, MD
Herbert Walberg, University of Illinois at Chicago, Chicago, IL

CHAPTER 3

Sample Design

Chapter 3

SAMPLE DESIGN

Morris H. Hansen, Keith Rust, and John Burke

Westat, Inc.

The sample of students for the 1986 NAEP was selected using a complex multistage sample design involving the sampling of students from selected schools within 94 selected geographic areas, called primary sampling units (PSUs), from across the United States. The sample design is described in detail in National Assessment of Educational Progress--17th Year Sampling and Weighting Procedures, Final Report (Burke, Braden, Hansen, Lago, & Tepping, 1987). This chapter provides an overview of the design.

Although generally similar in nature to the sampling procedures used in the 1984 assessment, a number of new features were introduced in the 1986 design. The most important of these are listed below.

1) The definition of primary sampling units and their stratification was changed. In particular, whole metropolitan statistical areas were generally defined as PSUs. The 34 largest of these were sampled with certainty.

2) The number of PSUs sampled was increased from 64 to 94.

3) "Bridge" samples were defined for the assessment of 13-year-olds in fall and 9-year-olds in winter, using a subsample of 64 of the 94 selected PSUs. The bridge samples were used for certain of the bridging studies, needed for comparisons with earlier NAEP assessments, which took place in fall for 13-year-olds and winter for 9-year-olds.

4) In schools with enrollment of small to moderate size, all eligible students were selected for assessment in sampled schools. In larger schools, a sample of eligible students was assessed. Overall there was a moderate increase in the numbers of students assessed per school, compared with 1984.

5) Efforts were made, through varying the probabilities of selection of PSUs and schools, to increase the proportion of the overall sample comprising Black and Hispanic students for each age class.

3.1 SAMPLE OF FIRST-STAGE UNITS

In the first stage of sampling, the United States (the 50 states and the District of Columbia) was divided into geographic primary sampling units (PSUs), each comprised of either a metropolitan statistical area (MSA), a single county, or a group of contiguous counties. Each PSU met a minimum size requirement, based on 1980 Census population data. The use of whole MSAs as PSUs was a departure from the procedure used in the 1984 and previous years. This change was designed to reduce sampling variance, particularly for estimates relating to minority groups. With the use of whole MSAs as PSUs, the large PSUs are considerably larger and more heterogeneous than with the use of counties as first-stage units. One consequence is a smaller variance between PSUs within noncertainty strata. Another consequence is that the PSUs that come into the sample with certainty account for a high proportion of the population (roughly one third of the total population and approximately one half of the Hispanic and the Black populations are included in PSUs selected with certainty), whereas with the larger PSUs defined in terms of whole counties, as in the past, certainty selections accounted for roughly 5 percent of the population. These two factors combined greatly reduce the between-PSU contribution to variance, with little or no added cost for travel within PSUs.

Twelve subuniverses of PSUs were defined. The PSUs were classified into four regions, each containing about one quarter of the U.S. population. In each region, PSUs were classified as MSA or non-MSA. In the Southeast and West regions, the PSUs were further classified as high minority (20 percent of the population in the 1980 Census was either Black or Hispanic) or not. The resulting subuniverses are shown in Table 3.1. Among the larger PSUs, 34 were large enough to be designated as certainty units and were selected with probability one. Within each major stratum (the subuniverses), further stratification was achieved by ordering the noncertainty PSUs according to several additional socioeconomic characteristics, yielding 60 strata. One PSU was selected with probability proportional to size from each of the 60 noncertainty strata. PSUs within the high-minority subuniverses were sampled at twice the rate of PSUs in the other subuniverses.

The increase in sample size from 64 to 94 PSUs was also aimed at decreasing the component of variance contributed by sampling at the first stage, and thus reducing the variances of sample estimates. This gain was rendered cost-effective in part by the fact that all of the main NAEP assessments were conducted simultaneously in the spring, rather than at a separate time for each grade/age, so that there was sufficient work within each PSU to keep one or more teams, consisting of a supervisor and exercise administrators, fully occupied throughout the assessment period. Increasing the number of PSUs also gave rise to somewhat of an increase in the precision of sampling error estimates obtained using the jackknife approach, discussed in Chapter 14. As noted below, a subsample of 64 of the 94 PSUs was used for the smaller bridge samples, conducted in the fall and winter, to maintain their cost efficiency.

Table 3.1
The Sampling Subuniverses
and the Number of Noncertainty Strata in Each

	MSA PSUs		Non-MSA PSUs	
Region	Regular Strata	High minority Strata	Regular Strata	High minority Strata
Northeast	8	--	2	--
Southeast	4	6	4	6
Central	8	--	6	--
West	4	6	4	2
Total	24	12	16	8

These PSUs were used for both the spiral assessments and the bridge assessments conducted in the spring. The bridge assessments conducted in the fall and winter used a subsample of 64 PSUs which were selected from the complete set of 94 PSUs. The reduced number of PSUs used in the fall and winter arose because the sample sizes of students at each age were much smaller than for the spring assessment, so that cost considerations dictated that the number of PSUs selected should be reduced for these samples. In subsampling the PSUs, the 18 largest certainty PSUs were retained, while 46 of the 76 remaining PSUs were retained with probability proportional to a measure of size of the stratum from which they were drawn.

Further details of the stratification and sampling of PSUs are given in Burke et al. (1987), sections 2.1-2.3.

3.2 SAMPLING OF SCHOOLS

In the second stage of sampling, the public, Catholic, other private, Bureau of Indian Affairs, and Department of Defense schools within each of the 94 PSUs were listed according to the three grade/age groups. An independent sample of schools was selected separately for each of the grade/age groups. Thus, some schools were selected for assessment of two grade/age groups, and a few for all three groups.

The list of schools was derived from the fall 1984 list of U.S. elementary and secondary schools provided by Quality Education Data, Inc. This frame included information on school enrollment and grade span, as well as unique identification and address information.

Five subframes of schools were formed from the complete list of schools within the 94 PSUs. One frame was created for each grade/age group for the main NAEP assessment, with an additional frame each for both the age 9 and age 13 Bridge A samples. Each subframe was designed to include schools that in the aggregate were estimated to contain all but a trivial number of students in the eligible age range for the sample in question. In each case the frame coverage of the relevant age was estimated to be in excess of 99 percent. Table 3.2 below shows the grade span definitions used for the different frames. Any school having any one or more of the relevant grades was included in the appropriate frame. Thus, for example, a school with grades 1 through 6 was included in both of the age 9 frames, and both of the age 13 frames, but not the age 17 frame. In total, the five frames from the 94 PSUs included about 38,000 unique schools, and each school with a grade in the range 1 through 12 was included on at least one frame.

Table 3.2
Grade Definition of School Eligibility for Frame Inclusion

	Age 9	Age 13	Age 17
Fall/Winter (Bridge A)	2-5	6-9	--
Spring	1-4	5-8	9-12

The schools sampled for a grade/age group within each PSU were selected via a systematic sample, with probabilities proportional to assigned measures of size. For the spring samples, roughly equal measures of size were assigned to schools containing an estimated number of grade/age-eligible students ranging from 20 to 150 (for grade 3/age 9), or 20 to 200 (for grade 7/age 13 and grade 11/age 17). Schools above the indicated maximum size were selected with probabilities proportional to the estimated number of grade/age-eligible students. Schools with fewer than 20 estimated grade/age eligibles were assigned considerably lower measures of size, and thus reduced probabilities of selection, since they had considerably higher per-student administrative costs. Overall probabilities of selection for high-minority schools (those where more than 10 percent of students were Black, Hispanic, or Asian) were twice those for other schools to enlarge the sample for such students, thereby enhancing the reliability of estimates for these minority groups. In selecting the samples, the frames were sorted within PSU by minority status and the measure of size.

For ages 9 and 13, a sample of schools was drawn for the Bridge A assessment conducted in the fall and winter. These were then excluded from the frame when the sample of schools was drawn for the spring assessments. Within each PSU for each age class, clusters of schools were formed, with each cluster large enough to provide the required sample size of students. One cluster was then selected per PSU (except in the Chicago and Los Angeles MSAs, where three clusters were chosen).

After the initial sampling of schools was completed, information was obtained to update the sample for new eligible schools. Public school districts and dioceses of initially selected schools were asked to give information about new schools and schools with greatly increased enrollment or with changes in grade structure within their district/diocese. Similar information was sought for new and enlarged private schools in the same districts/dioceses. New and enlarged schools so identified were given an appropriate chance of inclusion in each of the samples for which they were eligible. Four new schools were sampled this way in total, but all were found ultimately to be out-of-scope.

In PSUs where school refusals were relatively heavy for a particular sample, substitute school selections were made, replacing the refusals (to the extent feasible), with schools from within the same PSU and similar in size, affiliation, grade span, and minority composition. This procedure maintained the student sample sizes needed, keeping variance and nonresponse bias at acceptable levels. Table 3.3 shows the number of schools selected (and in-scope), cooperating, and substituted in each of the school samples. The cooperation rates given are based on the initially selected sample of schools, and schools selected only for the Language Minority Probe are excluded. Note that since the response rates quoted do not include the substitute selections, the potential for nonresponse bias is likely to be somewhat less than these rates would indicate. This is because the substitute selections were chosen based on their similarity to the initially refusing selections.

Further details on the sampling of schools are given in section 2.4 of Burke et al. (1987).

Table 3.3
School Sample Sizes, Refusals, and Substitutes

	Grade 3/Age 9		Grade 7/Age 13		Grade 11/Age 17	
	Winter	Spring	Fall	Spring	Spring	Total
Selected, in-scope	186	494	153	560	521	1917
No eligible students enrolled	4	5	27	62	22	120
Refusals	25	52	24	61	90	255
Substitutes	18	20	11	18	24	91
Final assessed sample	175	457	113	455	433	1633
School cooperation rate	87%	89%	84%	89%	81%	87%

The considerable numbers of schools sampled with no eligible students enrolled resulted primarily from the fact that, for example, for grade 7/age 13, schools with grades 5, 6, or 8 but no grade 7 were sampled. Such schools had a reasonable chance of containing some age 13 students. Often they did have a number of eligible students, but sometimes they had none. Such schools account for the sampled schools with no eligible students enrolled. Because of the grade structure of schools, this occurred most often for age 13. These response rates are comparable with those of previous assessments. In both 1982 and 1984 the overall cooperation rate of schools was 88 percent.

3.3 ASSIGNMENT OF SESSIONS TO SCHOOLS, BY TYPE

The assignment of sessions to schools served as the third stage of sampling. This assignment was done separately by the three types of sessions, designated spiral, Bridge A (fall and winter), and Bridge B (spring), which represent separate samples of the student population.

The Bridge A assessments involved three distinct booklets each for ages 9 (winter) and 13 (fall). Schools to participate in these assessments were selected from the subsample of 64 PSUs which had been designated as the Bridge A PSUs. Each of the three distinct booklets for an age group was to be administered within each of the PSUs. To avoid the possibility that, for a given PSU, a particular bridge session might be assigned only to a school with one or very few eligibles, small schools were clustered with other schools in the same PSU to form clusters of a specified minimum number of eligibles. At each age bridge sessions were then assigned to schools with probability proportional to the estimated number of age eligibles within the school (or school cluster).

A subsample of the spring-selected schools were allocated Bridge B sessions. Bridge B consisted of two tape-administered sessions (booklets 4 and 5). Bridge B was conducted in all 94 sample PSUs. Most schools allocated to a Bridge B assessment also participated in the spiral assessment.

In many schools selected for spring assessment a number of students were assessed as part of the Language Minority Probe, rather than for spiral or bridge assessment. Details of the sample design for the Language Minority Probe are given in Appendix A of Burke et al. (1987).

Chapter 3 of Burke et al. (1987) contains fuller details on the assignment of sessions to schools.

3.4 THE SAMPLES OF STUDENTS

In the fourth stage of sampling, a consolidated list of all grade-eligible and age-eligible students was established for each spring-selected school. Only age eligibles were listed for Bridge A, since there was no assessment of students eligible by grade alone.

For spring-selected schools with fewer than 233 eligibles for grade 11/age 17, 244 eligibles for grade 7/age 13, and 166 eligibles for grade 3/age 9), all eligible students were invited for assessment (some of them for the Language Minority Probe in some schools). Otherwise, a systematic sample of eligible students was drawn (about 210 for grade 11/age 17, 220 for grade 7/age 13, and 150 for grade 3/age 9). In all cases, the list of eligible students was prepared by the school, and sampling (if any) was undertaken by Westat district supervisors using prescribed computer-prepared instructions, tailored to each individual school, and based on the estimated number of eligibles in the school. For the spring assessment, students were assigned by Westat district supervisors to spiral or Bridge B sessions, using a prescribed probability sampling procedure.

For Bridge A assessments, many of the selected schools had their age eligibles sampled at a rate of one. Age-eligible students in large schools in selected bridge school clusters were sampled at a rate calculated to provide the target sample size.

3.5 THE SAMPLE OF EXCLUDED STUDENTS

Some students selected for the sample were deemed unassessable by the school authorities because they had limited English language proficiency, were judged as being educable mentally retarded, or were functionally disabled. In these cases, an excluded student questionnaire was filled out by the school staff, listing the reason for excluding the student and providing some background information.

3.6 STUDENT PARTICIPATION RATES

Table 3.4 below summarizes the rates of exclusion and participation of invited students for the different age classes in 1986. Rates were very similar to those experienced in 1984. Make-up sessions were called for when, for various reasons, more than a tolerable number of invited students did not appear for the originally scheduled assessment sessions in a school. The participation rate gives the number of students assessed as a percentage of the number invited. Note that although the participation rate for grade 11/age 17 declined somewhat from that of the 1984 assessment, it is in excess of the rate the rate of 74.2 percent attained in the 1981-82 assessment.

Table 3.4
Participation and Exclusion Rates by Age Class
(Unweighted, Excluding Language Minority Probe)

	Excluded (%)	Number Invited	Participation Rate (%)	Participation Rate (%)--1984
Grade 3/Age 9	3.9*	34,741	92.9	91.3
Grade 7/Age 13	3.7*	42,641	89.2	87.3
Grade 11/Age 17	3.4	55,309	78.9	82.8

*Exclusion rates given are for spring assessment only. Participation rates include both spring and fall/winter samples.

3.7 THE ASSOCIATED TEACHER-STUDENT SAMPLE

The teacher questionnaire was administered to the teachers of a subgroup of students sampled for spiral sessions. The purpose of this sample was to estimate the number (proportion) of students whose teachers had various attributes, not to estimate the attributes of the teacher population.

It was assumed that at grade 3/age 9 most teachers who taught reading also taught mathematics and science, and so questions covering instruction in all three subject areas were included in the questionnaire for this grade/age. For the other grade/ages it was assumed that different teachers would be teaching each of the subject areas covered by the assessment. Since the budget did not permit the collection of information from teachers from all subject areas within each school, a sampling scheme was devised. One subject area was designated at random for each spiral-allocated school. As noted, for grade 3/age 9 the subject was always reading. For grade 7/age 13 the subject area selected was one of three: reading, mathematics, and science. For grade 11/age 17 the subject area was one of four: reading, mathematics, science, and U.S. history.

A sample of teachers of the selected subject area was drawn in each school in the following manner. For each spiral session, a subsample of students was selected and the school coordinator was asked to identify, for each such student, the teacher in the designated subject area who was teaching the student. (For reading, English or language arts teachers were selected.) Up to five teachers per school were selected in this manner. These instructors completed a teacher questionnaire.

Chapter 4 of Burke et al. (1987) describes in detail the steps used to obtain the various student and teacher samples.

CHAPTER 4

Instrument and Item Information

Chapter 4

INSTRUMENT AND ITEM INFORMATION[1]

Janet R. Johnson

Educational Testing Service

The 1986 assessment incorporated five distinct instruments: student assessment booklets, a questionnaire for excluded students, a teacher questionnaire, a computer coordinator questionnaire, and a school characteristics and policies questionnaire. The data collected from these instruments are available on the 1986 NAEP public-use data tapes. This chapter, which describes the assessment instruments, begins with a discussion of how items were organized into blocks to create the student assessment booklets.

4.1 STUDENT ASSESSMENT INSTRUMENTS

Student assessment booklets contained both cognitive and noncognitive items. Cognitive items were used to assess student achievement in the subject areas of reading, mathematics, science, computer competence, U.S. history, and literature. These items were arranged into subject-specific blocks. Noncognitive items asked questions related to students' backgrounds and attitudes. Some noncognitive items were presented to every student; these were placed together in a block called the common block or common core. Other noncognitive items were attitude items specific to one of the subject areas; these items appeared at the beginning of blocks containing cognitive items related to the same subject area.

Each student at all three grade/ages was administered a single booklet containing the common background block followed by three subject-area blocks. The composition of the booklets varied. For example, the balanced incomplete block (BIB) spiralled booklets contained either 0, 1, 2, or 3 reading blocks; the remaining blocks, if any, were in mathematics, science, computer competence, or, in the case of 4 of the 93 booklets used at grade 11/age 17, U.S. history and literature. Note: The reading blocks used for grade 7/age 13 were identical in every respect to those used for grade 11/age 17.

Table 4.1 shows the total number of blocks created for each subject area.

---

[1] Some of the tables for this chapter were generated by David Freund and Alfred Rogers.

Table 4.1
Number of Subject Area Blocks Administered

Subject Area	Grade 3/Age 9	Grade 7/Age 13	Grade 11/Age 17
Reading	6	6	6
Mathematics	7	9	11
Science	7	9	11
Computer Competence	3	6	6
U.S. History	-	-	4
Literature	-	-	4
Total	23	30	42

The incomplete BIB design of these blocks generated a total of 52 booklets for grade 3/age 9, 68 booklets for grade 7/age 13, and 93 booklets for grade 11/age 17. (Of these, one booklet at each age was specially constructed for use in the Language Minority Probe. The booklet contained a special block of background questions tailored to Language Minority students, followed by the standard common background block, one block of reading cognitive items, and one block of mathematics cognitive items.)

Tables A.1, A.2, and A.3 in Appendix A show which subject area blocks were contained in each booklet for each grade/age. Tables A.4, A.5, and A.6 in Appendix A are matrices showing, for each grade/age, the number of times each block is paired with every other block in the BIB spiral sample.

The 1986 assessment included two bridge studies. For 9-year-olds and 13-year-olds, Bridge A measured the effect of changing the student age definition (from calendar year to school year) and the time of year the assessment was conducted (from fall and winter to spring). Since neither age definition nor time of testing was changed for 17-year-olds, those students were not included in the Bridge A study. Each Bridge A student took a single booklet containing a mathematics block, a reading block, and a science block. (Booklet configuration is shown in Table 4.2.) The same booklet was administered to an entire assessment session. The mathematics and science blocks were paced (presented aurally using a tape recorder). The tape recorder was turned off for the reading block in each session.

Table 4.2
Bridge A Booklet Configuration

	Blocks					
Booklet #	Age 9			Age 13		
1	9R1	9M1	9S1	13R1	13M1	13S1
2	9S2	9R2	9M3	13S2	13R2	13M3
3	9M2	9S3	9R3	13M2	13S3	13R3

The second bridge study, Bridge B, measured the effect of changing from tape-recorded administration to print administration. Each student in this bridge sample also took a single booklet containing three blocks: either two science blocks and one mathematics block, or two mathematics blocks and one science block. Booklet configuration is shown in Table 4.3.

Table 4.3
Bridge B Booklet Configuration

	Blocks								
Booklet #	Age 9			Age 13			Age 17		
4	9M1	9M2	9S3	13M1	13M2	13S3	17M1	17M2	17S3
5	9S1	9S3	9M3	13S1	13S2	13M3	17S1	17S2	17M3

4.1.1 Timing

The length of time allotted for each block changed slightly from 1984 to 1986. In 1984, each age was given a 6-minute common core of background and attitude questions followed by three subject area blocks of 14 minutes each. At the end of each 14-minute interval, the students were told to move to the next block. Approximately the first 2 minutes of these subject area blocks were devoted to answering background questions related to the subject area. In 1986, 13- and 17-year-olds again had 6 minutes to respond to the common core background and attitude questions; however, for 9-year-olds, the common core questions at the beginning of each booklet were read aloud to them and took 15 minutes to complete. The 9-year-olds were given 13 minutes to read and respond to the exercises in each subsequent block; the 13- and 17-year-olds were given 16 minutes. The number of exercises per block was increased to allow for the amount of time allotted for each block. With the exception of one mathematics block and two science blocks at age 9, all subject area blocks at all ages contained some background and attitude questions.

For an overview of the composition of the 1986 assessment blocks see Tables A.7, A.8, and A.9 in Appendix A. Tables A.10, A.11, and A.12 in Appendix A show, by grade/age, the booklets in which each item block appears.

Many items in each subject area were used at more than one grade/age. Tables A.13 through A.18 in Appendix A list each 1986 cognitive item in NAEP ID order, with a short descriptor, the block in which the item appears for each grade/age, and the location of the item within the block. Tables A.19 through A.25 provide the same information for each noncognitive item. Complete item text is available on the microfiche accompanying the public-use data tapes.

4.2 EXCLUDED STUDENT QUESTIONNAIRE

The excluded student questionnaire was developed and used for the first time in the 1984 assessment. It was designed to gather more information about particular conditions for exclusion and characteristics of the learning experience of excluded students.

The questionnaire was completed by school personnel for every student who was selected for inclusion in the NAEP sample but was unable to respond to items because he or she was judged by school personnel to be non-English speaking, educable mentally retarded, or functionally disabled. The three-page questionnaire was used to gather information concerning special education, language, and other student programs. A copy of the excluded student questionnaire is available on the microfiche accompanying the public-use data tapes.

Of the 119,137 students sampled for the 1986 assessment, 5,209 were excluded by the school due to classification as educable mentally retarded, non-English speaking, or functionally disabled. There were 1,476 (4.4 percent) excluded students in grade 3/age 9, 1,768 (4.4 percent) in grade 7/age 13, and 1,965 (4.3 percent) in grade 11/age 17.

4.3 TEACHER QUESTIONNAIRE

The teacher questionnaire, developed and used for the first time in the 1984 assessment, was used in 1986 to gather information on teachers of various subjects. One subject from the list in Table 4.4 was designated for each grade/age assessment in each school.

Table 4.4
Subjects Taught by 1986 Teacher Sample

Grade 3/Age 9	Grade 7/Age 13	Grade 11/Age 17
English/Language Arts	English/Language Arts	English/Language Arts
	Mathematics	Mathematics
	Science	Science
		U.S. History

At grade 3/age 9 the English/language arts teacher questionnaire also contained several questions about mathematics and science instruction because it was assumed that these younger students were taught all subjects in a self-contained classroom situation.

At grade 7/age 13 and grade 11/age 17, the multistep sampling process for the selection of teachers to answer the questionnaire resulted in students being introduced to as many as five teachers' names before the assessment began.

For each spiral session, a subsample of students was selected and the school coordinator was asked to identify, for each selected student, the teacher in the designated subject area who was teaching the student. These instructors completed the teacher questionnaire.

Responses were received from a total of 774 3rd grade teachers, 784 7th grade teachers, and 1,243 11th grade teachers. A copy of the teacher questionnaires is available on the microfiche accompanying the public-use data tapes.

4.4 COMPUTER COORDINATOR QUESTIONNAIRE

This instrument was used to gather information about subjects aided by computer instruction, computer topics and courses taught, and computer resources. The computer coordinator questionnaire was not linked to students. The questionnaire was completed by the computer coordinator, if there was one, for each school included in the spiral assessment. If the school did not have a full- or part-time staff member who coordinated the use of computers for instruction and/or taught about computers, then no questionnaire was completed by that school.

Computer coordinator questionnaire responses were received from 232 of 632 3rd grade schools, 373 of 568 7th grade schools, and 328 of 433 11th grade schools.

A copy of the computer coordinator questionnaire is available on the microfiche accompanying the public-use data tapes.

4.5 SCHOOL CHARACTERISTICS AND POLICIES QUESTIONNAIRE

A school characteristics and policies questionnaire was distributed to each participating school to be completed by either the school's principal or another person familiar with data concerning enrollment, facilities, curricula, and staff development.

Responses were received from 583 of 632 cooperating 3rd grade schools, 521 of 568 cooperating 7th grade schools, and 392 of 433 cooperating 11th grade schools. Cooperation rates were 88.7, 88.1, and 82.7 respectively for 3rd, 7th, and 11th grade schools; the overall cooperation rate was 86.8 percent.

A copy of the school characteristics and policies questionnaire is available on the microfiche accompanying the public-use data tapes.

CHAPTER 5

Field Administration

Chapter 5

FIELD ADMINISTRATION

Nancy Caldwell and Renee Slobasky

Westat, Inc.

5.1 ORGANIZATION

The field work for the 1986 National Assessment was directed by the field director and assistant field director(s) in Westat's home office. Reporting to them were district supervisors, each responsible for contacting districts and schools and conducting the assessments in their geographic region. Each district supervisor hired, trained, and supervised the work of local exercise administrators, who conducted the assessment sessions. ETS home office and regional staff supported the district supervisors, responding to requests for technical information about the assessment and working to convert schools and districts that refused to participate in the assessment.

Because the spring assessment in 1986 differed in so many ways from the fall and winter, the field organization, staffing and materials were also very different[1]. During the fall and winter, 16 district supervisors were responsible for all assessment activities in 64 PSUs. During the spring, the number of PSUs increased to 94. The workload within each spring PSU also increased substantially because all three grade/age groups were assessed at the same time. Recognizing this increased workload, Westat expanded the district supervisory staff substantially from 16 (plus two backup supervisors) to 54.

The district supervisors were responsible for the following tasks in each of the areas assigned to them:

- contacts with districts and schools;
- hiring and training local exercise administrators;
- selecting the sample of students to be assessed in each school following the detailed sampling specifications provided by Westat;
- making all arrangements with the schools;
- supervising the conduct of the assessment;

---

[1] See section 1.2.1 for a discussion of the fall, winter, and spring assessment schedules and the grade/age groups assessed during these periods.

- distributing and collecting assessment questionnaires;
- completing all administrative records and forms; and
- preparing and shipping completed assessment materials to ETS and Westat.

The district supervisors were trained by home office staff before they began their work in the field. Each supervisor then trained his or her own exercise administrators to work in the local areas.

5.2 OBTAINING DISTRICT- AND SCHOOL-LEVEL COOPERATION

During the summer of 1985, ETS made preliminary contacts with the states and districts that had schools in the NAEP sample. These initial letters were followed by telephone and in-person contacts by the district supervisors and ETS staff in the early fall. Introductory meetings were held with school and district staff to describe assessment procedures and make preliminary arrangements for the assessment in each school.

The results of the school contacting phase of the project are discussed in detail in the final report on sampling and weighting procedures (Burke, Braden, Hansen, Lago, & Tepping, 1987, pp. 2-15). To summarize, there was a total of 2,309 schools originally selected to participate in the fall, winter, and spring assessments, including the Language Minority Probe. Of these, 78 were closed or out of scope, leaving 2,231 eligible schools. Cooperating schools (including 133 schools with no eligible students enrolled) numbered 1,927 (86.4 percent). There were 304 refusals. Cooperation was slightly higher among schools selected for the regular NAEP sample than for those selected for the Language Minority Probe (86.8 percent versus 83.6 percent). Further details on cooperation among schools excluding those selected solely for the Language Minority Probe are given in Table 3.3 of Chapter 3.

Assessments were conducted in a total of 1,887 schools. Of these, 1,794 were cooperating schools in the original sample that had eligible students enrolled. The remaining 93 schools were replacements for refusals.

5.3 SELECTING THE SAMPLE OF STUDENTS TO BE ASSESSED

The schools were given instructions for preparing lists of age and grade eligible students. Because of the Language Minority Probe, schools in the spring assessment were asked to prepare three lists: one of eligible Hispanic students, one of eligible Asian American and American Indian students, and one of all other eligible students. Prior to the assessment date, the district supervisor visited the schools to select the sample and to make final arrangements for the assessment. Supervisors received school-specific sampling instructions from Westat's home office, which they followed to select the sample of students to be invited to the assessment. If the number of eligible students in a particular school was very different from what was anticipated, the district supervisor called the home office for revised instructions.

Once the sample of students was selected, final arrangements could be made with the school for the assessment of those students. Arrangements varied depending on factors that included the number of students to be assessed, the availability of space in the school, and the school's schedule, as well as other considerations. Since the BIB-spiral booklets are self-administered, there was considerable flexibility in setting up the assessment sessions.

5.4 CONDUCT OF THE ASSESSMENT

Each assessment session took a little over one hour to conduct, although there was some variation depending on how quickly the students arrived for the session and how many booklets had to be distributed. An introduction and directions were read by the NAEP staff following a prescribed script. The supervisor and exercise administrators monitored the sessions to make sure that students were working on the appropriate sections of the booklets. Quality control visits were conducted by ETS and Westat home office staff to ensure that the assessment sessions were being administered correctly and uniformly by field staff.

As in previous cycles of the assessment, the number of students assessed varied by age group. From among the students invited within participating schools, the percent assessed was highest for grade 3/age 9 (92.9 percent), next highest for grade 7/age 13 (89.2 percent) and lowest for grade 11/age 17 (78.9 percent)[2]. The 1986 and 1984 experiences are compared in Chapter 3 and shown in Table 5.1.

Table 5.1
Comparison of 1986 and 1984 Student Participation Rates
by Grade/Age

	Participation Rate	
Grade/Age	1986	1984
Grade 3/Age 9	92.9	91.3
Grade 7/Age 13	89.2	87.3
Grade 11/Age 17	78.9	82.8

5.5 REPORT ON THE FIELD ADMINISTRATION

A thorough discussion of the field organization and operations is presented in the Westat Report on Field Operations and Data Collection Activities, NAEP-Year 17 (1985-86) (Caldwell & Slobasky, 1988).

---

[2] Includes Bridge A for 13-year-olds and 9-year-olds.

CHAPTER 6

Materials Processing and Database Creation

Chapter 6

MATERIALS PROCESSING AND DATABASE CREATION

John L. Barone

Educational Testing Service

The following chapters detail the receipt, processing, and final disposition of the assessment materials at ETS as they were transcribed to computer-readable form and placed in an integrated NAEP database to be used for data analysis and reporting. This database is now available to external users via the public-use data tapes (see Rogers, Kline, Norris, Johnson, Mislevy, Zwick, Barone, & Kaplan, 1988).

The scope of the effort required to perform this aspect of the 1986 assessment is evidenced by the following numbers. For the 1986 assessment,

- more than 150,000 assessment booklets were received and processed.

This processing included:

- optically scanning more than 3 million double-sided pages;
- professionally scoring more than 700,000 student responses on 240 open-ended items;
- manually key-entering and verifying more than 16,000 assessment booklets;
- using the NAEP minicomputer-based transcription system to track, audit, edit, and resolve more than 28 million characters of information;
- for quality control, selecting and comparing more than 160,000 characters of transcribed data to the actual responses in assessment booklets;
- cataloging more than 2 million characters of information on a total of 4,800 assessment items and derived variables, as part of a comprehensive item information database;
- developing a public-use data tape package containing more than 150 million characters of useful information.

These numbers alone indicate the staggering size of 1986 NAEP materials processing and database operations. However, the full extent of this effort becomes clearer when one considers that over 90 percent of the data transcription activities described in this chapter were started and completed within a six-month period, with a conservatively estimated accuracy rate of fewer than 2.5 errors for every 10,000 characters of information transcribed.

Materials processing and database creation for the 1986 assessment closely paralleled the processes used in the 1984 assessment. This allowed the use of in-place, proven operational procedures and computer systems, which will be highlighted throughout the following chapters.

A major improvement in the 1986 assessment was the introduction of scannable booklets and the concomitant shift of most data transcription from manual key entry to computerized scanning. The NAEP systems were adapted to accommodate scanning technologies and procedures and were expanded to perform remote computer processing via network technologies.

In past NAEP assessments, each of the three grade/age groups were assessed at different times during the school year. This allowed the data transcription to occur over a nine-month period. In the main 1986 assessment, NAEP assessed all three grade/age groups in the spring. The high volume of input combined with a much shorter time period for processing precluded manual entry and verification of student booklets. For this reason, the 1986 assessment booklets were designed to be read by computer scanning devices, and the NAEP data transcription systems were modified to accept the output of the scanning devices.

The flow of materials, creation of data files, and creation of the NAEP database are depicted as an ordered set of processes that are applied either to the assessment materials or to the transcribed data. The following chapters describe each of these processes in detail.

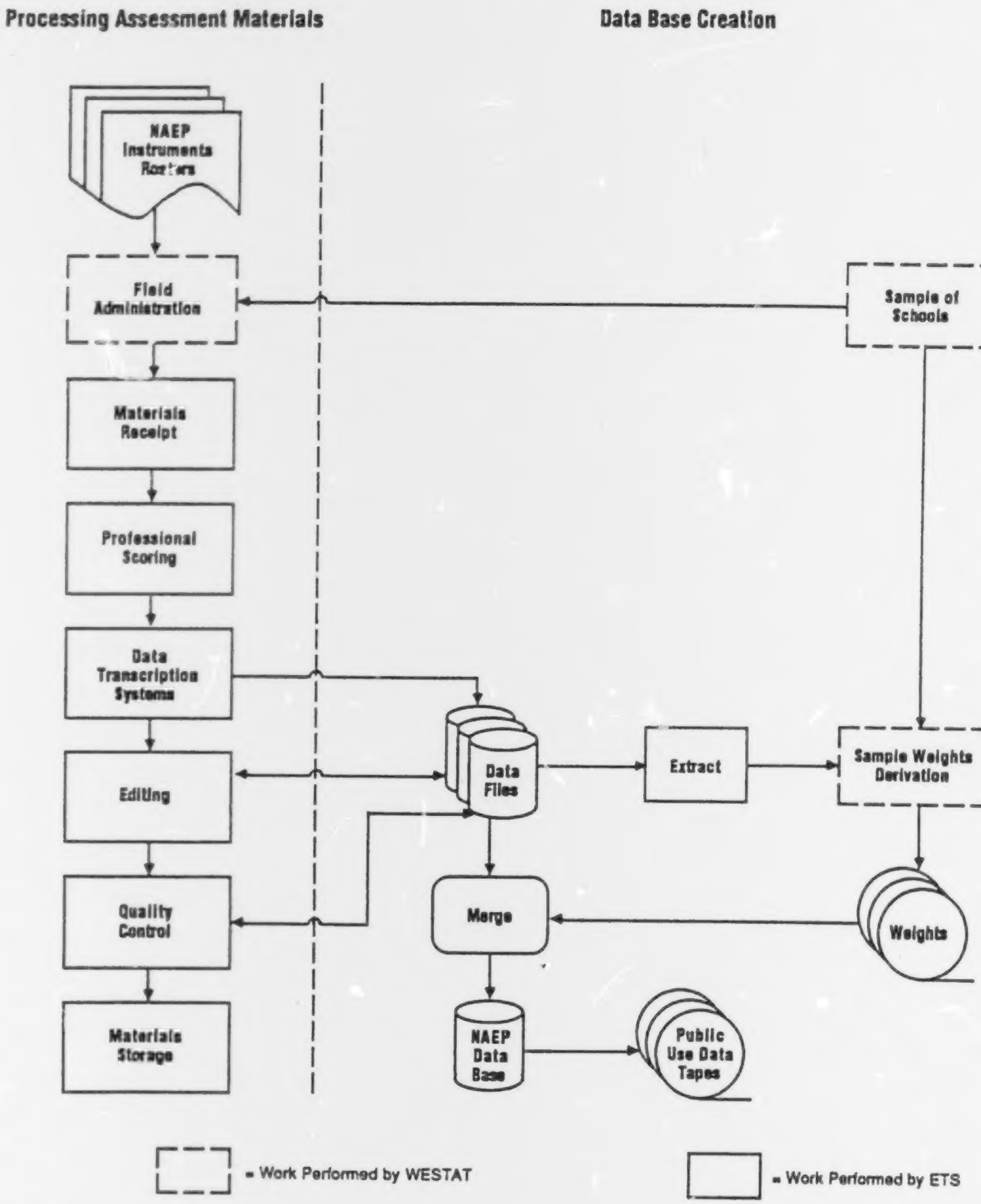
The large volume of collected data and the complexity of the NAEP design, with its spiralled distribution of many booklets, required the development and use of NAEP-specific data entry and management systems, including carefully planned and well-defined editing, quality control, and auditing procedures. This chapter discusses the original 1984 design and implementation of these systems, and the adaptation and use of these systems and processes as applied to the 1986 assessment. The results were effective, responsive data management procedures that ensured the quality and integrity of NAEP data, and a NAEP database that met the original objectives of integrity and usefulness, exceeding stringent standards for "correctness" and quality.

Figure 6.1 is a flow diagram that shows the conceptual framework of ordered processes that were applied to the NAEP materials and data files. The dashed line through the center of the figure divides the outline into two sets of processes, processing assessment materials and database creation, described below.

The processes represented by solid-line boxes in the flow diagram were performed at ETS on the paper materials or computer files. The three processes enclosed in dashed-line boxes (sample of schools, field

Figure 6.1

Data Flow Overview


Processing Assessment Materials
Data Base Creation
NAEP Instruments Rosters
Field Administration
Sample of Schools
Materials Receipt
Professional Scoring
Data Transcription Systems
Data Files
Extract
Sample Weights Derivation
Editing
Quality Control
Merge
Weights
Materials Storage
NAEP Data Base
Public Use Data Tapes
= Work Performed by WESTAT
= Work Performed by ETS

administration, and derive sampling weights) were performed by Westat and are discussed respectively in Chapters 3, 5, and 14. Two Westat reports, the Report on Field Operations and Data Collection Activities, NAEP--Year 17 (1985-86) (Caldwell & Slobasky, 1988) and National Assessment of Educational Progress--17th Year Sampling and Weighting Procedures. Final Report (Burke, Braden, Hansen, Lago, & Tepping, 1987), discuss these processes in detail.

6.0.1 PROCESSING ASSESSMENT MATERIALS

The left side of Figure 6.1 depicts the flow of NAEP "paper" materials. Chapter 6.1 describes this flow in detail and discusses how information contained on the field rosters, schedules, and worksheets were used as controlling mechanisms for processing of materials. The figure follows the path of each assessment instrument (student assessment booklets, school characteristics and policy questionnaires, computer coordinator questionnaires, teacher questionnaires, and excluded student questionnaires), absentee rosters, school worksheets, and administration schedules as they are tracked through the appropriate processes that result in the final integrated NAEP database.

The following is a brief description of the materials processing activities as shown on the left side of Figure 6.1. Each description refers the reader to the section(s) or chapter(s) in which the process is discussed in detail.

Field Administration is the conduct and monitoring of the NAEP assessment in the schools. Chapter 5 summarizes this process.

Materials Receipt refers to receipt and processing of assessment materials at ETS. Section 6.1.1 describes the procedures and forms that were used to check and verify the receipt of documents from the field. It also discusses the follow-up procedures that were initiated when discrepancies were identified and the subsequent batching of NAEP materials for further processing and data transcription.

Professional Scoring is the process that resulted in the scoring of the open-ended NAEP reading, mathematics, science, and computer competence items. Chapter 6.2 describes the items, types of scoring used, scoring operation, reliability checks, and resolution of scoring discrepancies. Entry and editing of this data are discussed in sections 6.1.4 and 6.4.2.

Data Transcription Systems refers to the methodology used to transcribe NAEP materials into computer-readable form. The transcription method used for each type of NAEP instrument is discussed in Chapter 6.1. Chapter 6.3 describes the design, structure, and development of the NAEP-specific data entry system used to transcribe most of the NAEP materials to computer files; it also discusses the tracking and audit mechanisms that were built into the system to ensure that all data was properly processed and accounted for.

Originally implemented for the 1984 assessment, NAEP's data transcription system has proven to be accurate, efficient, and flexible. It began in 1984 by using manual key entry and verification as the prime vehicle for data entry. In the 1986 assessment it was modified to accept scannable booklets as the main source of input, while retaining the manual entry and verification component for materials that were not designed as scannable documents as well as for scannable documents that for some reason (e.g., torn) could not be read by the scanner.

Editing refers to the ETS procedures that ensured the correctness and integrity of the NAEP data files by (1) validating every field of NAEP data that was entered into computer-readable form, (2) identifying any invalid or inconsistent values, and (3) correcting or flagging as unresolvable those values identified as invalid or inconsistent. Chapter 6.4 describes these procedures.

Quality Control refers to the ETS procedures that assessed the accuracy of the data transcription and editing operations. Chapter 6.5 discusses the quality control procedures used in NAEP data processing and provides a summary of the likely error rates.

Materials Storage refers to the final disposition of NAEP paper materials after processing had been completed. Chapter 6.1 discusses materials storage.

6.0.2 Database Creation

The right side of Figure 6.1 depicts the evolution of the integrated NAEP database from the transcribed data to the final database, available to external users via the public-use data tapes. Chapter 6.6 describes the processes through which the database evolved.

The remainder of this section contains a brief description of each process involved in database creation as shown on the figure. Each description also refers the reader to the section(s) or chapter(s) in which the process is discussed in detail.

Sample of Schools refers to the process performed by Westat to select the schools to be included in the assessment. This process is discussed in Chapter 3.

Data Files refers to (1) the data files created by the ETS/NAEP data transcription, editing and resolution systems and (2) the labeling files (discussed in Chapter 6.6) that contain descriptive information on every item used in NAEP.

Extract is the process discussed in section 6.6.1 that created data files containing specific demographic data fields from the ETS/NAEP data files. These data files were required by Westat to derive sampling weights.

Sample Weights Derivation was performed by Westat and is discussed in Chapter 14. This process produced computer tape files containing sampling weights for every student and school assessed by NAEP.

Merge refers to the final integration of NAEP data files into the NAEP database. This process, discussed in section 6.6.2, merged the NAEP data files, labeling files, and the NAEP sampling weights into one inclusive database.

NAEP Database is the final, integrated NAEP database that contains all 1986 NAEP data. This is the database that is ultimately made available to external users via the public-use data tapes. The structure of the internal NAEP database is discussed in Chapter 6.6; the public-use data tapes, which contain all of the nonconfidential data fields from the internal database, are discussed in Chapter 6.7.

CHAPTER 6.1

Processing Assessment Materials

Chapter 6.1

PROCESSING ASSESSMENT MATERIALS

Alfred M. Rogers and Norma A. Norris

Educational Testing Service

This chapter describes the procedures through which NAEP instruments, schedules, and worksheets were received at ETS, and the methods used in the subsequent scoring, scanning, loading, editing, and resolution of NAEP data.

6.1.1 RECEIPT OF MATERIALS

It was the responsibility of the district supervisor to complete and mail a postcard to ETS at the completion of assessment administration in each school. This card contained the assessed school identification, the number of boxes shipped, and the mode of shipment. The receipt of this card at ETS alerted staff to expect arrival of the shipment within seven working days. If after seven days the shipment had not arrived, ETS notified Westat, who in turn initiated a trace of the shipment. This tracing process was successful in all cases except one, in which the full set of assessment materials from one school was never recovered. Some other shipments broke open in transit. In all, 56 booklets were lost or damaged.

The shipment from each school contained the school worksheet; administration schedule; questionnaire roster; school, teacher, and excluded student questionnaires; and assessment booklets, bundled by session. The format and content of these instruments are documented in the Westat Report on Field Operations and Data Collection Activities, NAEP--Year 17 (1985-86) (Caldwell & Slobasky, 1988). The following discussion of check-in procedures presumes an understanding of information contained in and interrelationships among these instruments.

The school worksheet contained summary counts of the booklets used in all assessment sessions in each school. The booklets used within each session were counted and checked against the count written on the school worksheet. All discrepancies in the counts were referred to the administration schedules for resolution. The booklet numbers from the bundle in question were compared against the listing of booklet numbers on the schedule. If the discrepancy could not be resolved by this process, Westat was notified, who in turn contacted the appropriate district supervisor for resolution.

Two codes, the session code and the batch code, were then assigned to each column on the worksheet and to the corresponding bundle of booklets. The two-digit session code distinguished spiral from bridge sessions and regular from makeup sessions. Codes 1 through 10 identified regular spiral sessions;

code 11 was used for makeup spiral sessions; codes 21 through 25 uniquely identified regular bridge sessions, with the second digit corresponding to the booklet number; and codes 31 through 35 similarly identified the makeup bridge sessions.

The use of a batch identification code was necessitated by the introduction of machine-scannable documents in this assessment. A preprinted, scannable header sheet was attached to each bundle of student booklets to be used to identify it through all subsequent scoring, scanning, entry, and resolution processing. This batch header sheet was pregridded with a unique four-digit sequence code. As each header sheet was drawn from the pile, it was gridded with the age group code, the school and session codes, the current batching date, and the number of booklets to be processed. The age group code was either "N", "T", or "S" corresponding to the 9-, 13-, or 17-year-old cohorts. The batch identification code, which consisted of this age group code and the sequence number from the header sheet, was then written at the bottom of the session information on the school worksheet.

The teacher and excluded student questionnaires were then counted and compared against the questionnaire roster. All discrepancies in the teacher and excluded student questionnaire counts were referred to Westat and again, in turn, to the district supervisor for resolution. Field administration procedures permitted a separate shipment of teacher, excluded student, and school questionnaires. The questionnaire roster listed questionnaires not included in the shipment, alerting the receiving staff to expect a later shipment.

If the supervisor was unable to collect the questionnaires on the day of the assessment, a pre-addressed envelope was left at the school so that the school coordinator could mail the questionnaires directly to ETS. There was no other follow-up activity to obtain uncollected questionnaires from school personnel; efforts to encourage school cooperation were focused primarily on student assessment activities.

When all of the student-related materials for a school had been received and checked in, the assessment schedules, school worksheet, assessment booklets, and questionnaires were forwarded to the data operations coordinator for transcription processing. The operations coordinator separated these materials according to the appropriate data entry procedures: the administration schedules were accumulated and shipped in batches to key entry; the school worksheet and excluded student, teacher, and school questionnaires were sent directly to data entry systems. School worksheets were entered into the data entry system on a daily basis. Questionnaires were batched and held for data entry until scheduling permitted. Assessment session bundles were forwarded to the professional scoring area where open-ended items were scored. When scoring of the open-ended items was completed, the assessment session bundles were shipped to the optical scanning department.

6.1.2 ADMINISTRATION SCHEDULES

The administration schedules contain the demographic characteristics of the students selected for the assessment. This information, which included the sex, ethnic origin, grade, and birthdate of the sampled students, was used by Westat in the derivation of sampling weights. The booklet numbers of the students who participated were transferred to the schedule at the time of the assessment, and the demographic information was in turn transferred to the front covers of the booklets after the assessment.

The demographics of the students who were sampled but did not participate in the assessment (exclusions and absentees) were used to adjust the sampling weights of those who did. The excluded student information could be obtained from the excluded student questionnaire data, but the information on absentees could only be found on the administration schedules. It was therefore necessary to transcribe this information to computer-readable media and combine it with the assessed and excluded student data.

The administration schedule data was transcribed to computer tape by the key entry systems at ETS. One record was generated for each absent student (line) on the form. The PSU, school, and session codes from the top of the form were repeated for each student on the form. The information transcribed for each absent student included sex, grade, and birthdate. These data were ultimately used by Westat to adjust the sample weights.

At the completion of entry processing, the keyed data tape was copied to a disk file for editing and quality control processing. The editing process consisted of a validation program and an interactive text editor for correcting erroneous data. The validation program checked that the demographic information was present and within the appropriate ranges. The schedules were referred to during this process for the resolution of any errors or discrepancies uncovered by the program and to "spot-check" records for quality control.

The assessment schedules were retained by the operations coordinator in anticipation of future questions about and references to the sample. This proved to be the most efficient and compact means of retaining the relevant raw data since the schedules for all three grade/age assessments could be contained in three storage boxes.

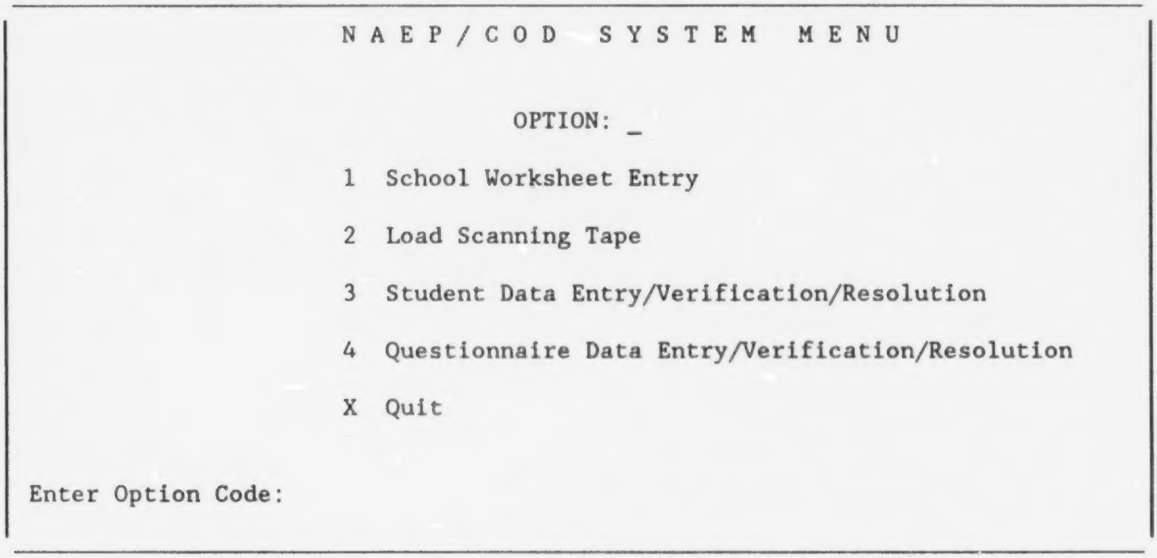
6.1.3 SCHOOL WORKSHEETS

Each column of the school worksheet contained information pertaining to the administration activity of each session within a school. This information included the date, time, and location of the administration, the exercise administrator code, and the counts of the students sampled, absent, and assessed. Additionally, each column contained a session code and batch identification code that were written in by receipt processing staff. This information was entered into the system by selecting the first option on the data entry menu (Figure 6.1.1).

The worksheet entry program received its input through two entry screens. The first entry screen (Figure 6.1.2) requested school-level information: the PSU and school codes and the total number of sessions to be entered for that school. This count was further broken down into the four types of sessions: regular spiral, makeup spiral, regular bridge, and makeup bridge. The program would then display the second entry screen (Figure 6.1.3) once for each session, requesting the session-level information. When all sessions for a school had been entered, the program would redisplay the first entry screen, ready to process the next worksheet. The operator could either enter new information or press ENTER to return to the main menu.

Figure 6.1.1

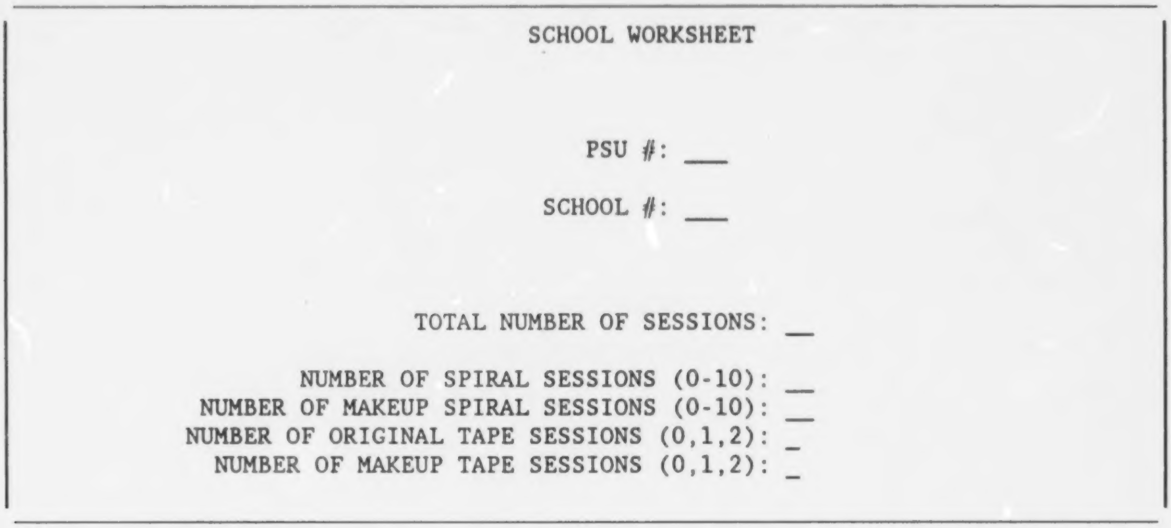
Data Entry System Main Menu



```
                         N A E P / C O D   S Y S T E M   M E N U


                                      OPTION: _

                         1  School Worksheet Entry

                         2  Load Scanning Tape

                         3  Student Data Entry/Verification/Resolution

                         4  Questionnaire Data Entry/Verification/Resolution

                         X  Quit


Enter Option Code:
```

Figure 6.1.2

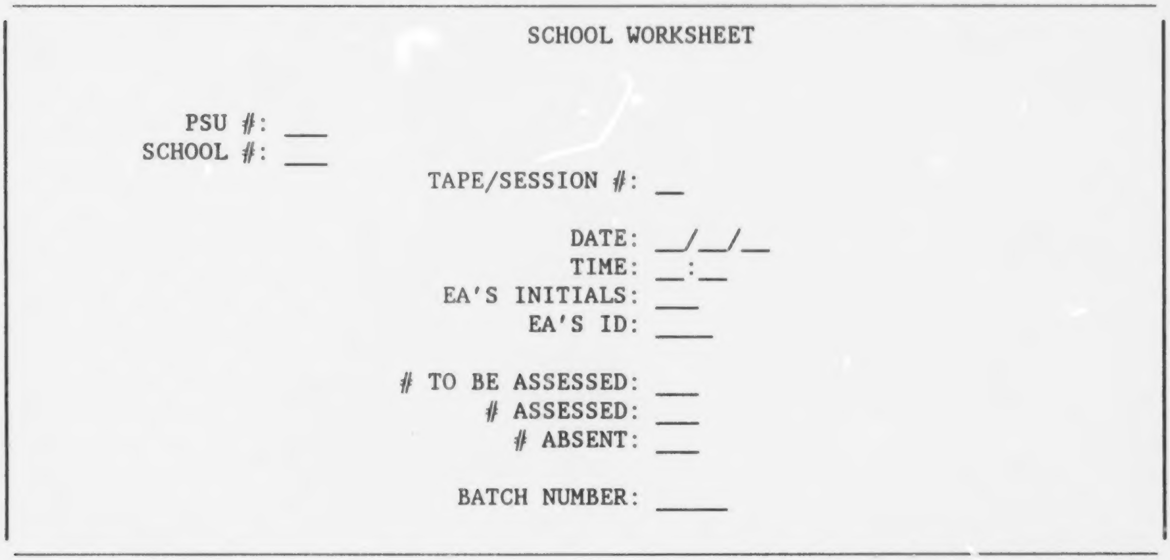
School Worksheet Entry Screen #1



```
                              SCHOOL WORKSHEET


                                   PSU #: ___

                                SCHOOL #: ___


                     TOTAL NUMBER OF SESSIONS: __

            NUMBER OF SPIRAL SESSIONS (0-10): __
      NUMBER OF MAKEUP SPIRAL SESSIONS (0-10): __
     NUMBER OF ORIGINAL TAPE SESSIONS (0,1,2): _
       NUMBER OF MAKEUP TAPE SESSIONS (0,1,2): _
```

Figure 6.1.3

School Worksheet Entry Screen #2



```
                              SCHOOL WORKSHEET

      PSU #: ___
   SCHOOL #: ___
                      TAPE/SESSION #: __

                                DATE: __/__/__
                                TIME: __:__
                        EA'S INITIALS: ___
                              EA'S ID: ____

                     # TO BE ASSESSED: ___
                           # ASSESSED: ___
                             # ABSENT: ___

                         BATCH NUMBER: _____
```

The entry system controlled the processing of student data and maintained statistics on the entry activity at the session level. This was accomplished by means of a tracking file, each record of which contained all control and reporting information for one session. The entry of the school worksheet information thus generated a new record on the tracking file for each session, initializing the control parameters.

The operations coordinator was provided with procedures for periodically monitoring and reporting data entry activity. These procedures compared the counts of booklets processed at each stage with the initial counts from the worksheet, and flagged discrepancies. This, in turn, alerted the coordinator to possible missing or extra booklets. If the school worksheet information was determined to be in error, the operations coordinator had the facility to correct the tracking file data to prevent reappearance of the discrepancies in the activity report.

The school worksheets were retained by the operations coordinator in anticipation of later queries, since they could be conveniently stored and easily referenced.

6.1.4 STUDENT ASSESSMENT INSTRUMENTS

The student assessment booklets were forwarded directly to the scoring area as the complete set of materials was received from each school. The booklets were batched by session, with a batch header sheet attached to the top of each bundle. This preprinted, scannable sheet contained the PSU, school, and session codes, and a unique batch identification code serving to identify each batch. The header sheets were retained with the batches throughout entry processing.

6.1.4.1 Professional Scoring

The batches of student booklets were sent from the receipt processing area to the scoring area where the open-ended reading, science, and mathematics items were read and scored. The procedures and guidelines followed in scoring these items are more fully described in Chapter 6.2.

Each open-ended item was provided with a set of scannable bubbles to be filled in by the reader. The bubbles were generally at the bottom of the page on which the item was printed to avoid distracting or confusing the student. When several open-ended mathematics were printed on the same page, the bubbles were printed adjacent to each item to facilitate their scoring. All open-ended reading and science items were provided with an extra set of bubbles to permit secondary scoring of the primary trait scores for inter-rater reliability analysis. Several of the reading items that were to be evaluated for secondary traits had an additional set of bubbles for each secondary trait score.

All of the spiral batches and some of the bridge batches were processed by four readers: the primary and secondary reading and science reader, and the primary and secondary mathematics reader. The mathematics readers were located in a separate area from the reading and science readers. Each area had three sets of shelves for controlling the processing of the booklets. The first shelf held the batches to be scored by the primary reader, the second had the batches for the secondary reader, and the third for the completed batches to be forwarded to the next area.

The primary reading and science reader would examine each booklet in a batch and determine if it contained any reading or science open-ended items. If so, the reader's identification code was written in and gridded in the second column of bubbles in the reader identification area on the inside front page. The reader would then locate and read each of the open-ended items for that booklet and grid the first primary trait score and all secondary trait scores into the appropriate bubbles. For every fifth booklet read, the reader would place a piece of tape over the primary trait score bubbles in order not to influence the secondary reader. The completed booklets were stacked in the same order in which they were received and the completed batch was placed on the second shelf.

The secondary reading and science reader selected every fifth eligible booklet from the batch in order to achieve a 20 percent rate of reliability scoring. This reader's identification code was entered into the third column of the reader identification area. The reader then located the items with concealed primary trait scores, read and scored them, and removed the pieces of tape. The completed batch was placed on the third shelf, to be forwarded to the mathematics scoring area.

The primary mathematics reader examined each booklet for the presence of open-ended mathematics items. These booklets were then gridded with the reader's identification code in the first column of bubbles. The responses were then evaluated for correctness and the scores gridded into the appropriate bubbles. The completed batch was placed on the second shelf for processing by the secondary reader. This reader performed a correctness check on every tenth booklet read by the primary reader. If this reader disagreed with the score given by the primary reader, the score was changed in the booklet and recorded on a separate roster. The completed batch was placed on the third shelf, to be forwarded to scanning processing.

6.1.4.2 Scanning

Before the batches of scored booklets could be sent to scanning, they had to be grouped by age cohort and placed into "capsules" that were then arranged sequentially on "carts." The capsules were cardboard boxes with one open side to facilitate access by scanning and resolution staff, and hangers on the other side to permit removal from the carts. The carts were transportable, two-sided hanging shelves with sloping sides to permit the capsules to hang with the open sides out while keeping the documents in. The carts were shipped to the scanning area.

The first step in the scanning process was to separate each booklet into its component pages for single-sheet processing by the scanner. Each booklet was secured by three staples along the left edge. The timing marks for the scanner were also printed along this edge. Two special machines were used to cut off the stapled edge without damaging the timing marks. The guillotine could cut three or four booklets at a time but required a slower, manual setup process. The slitting machine was more automatic, processing one booklet at a time, but was less precise than the guillotine. Careful handling of these booklets was imperative once they were cut, as the scanning program depended on the correct sequencing of pages within each booklet. The guillotined booklets were placed back in their capsules and the completed cart sent to the scanning machine.

The scanning machine operator identified the age cohort of the booklets to be scanned and started up the appropriate program on the computer. A magnetic tape was pulled from the scratch pile and mounted on the tape drive. Scanning was initiated by placing the sheets from the first capsule into the input hopper of the scanning device. The scanner then read both sides of each sheet and placed it into one of two hoppers. If no errors in readability or sequencing were detected, the sheet went into the output hopper and the next sheet was read from the input hopper. If an error was indicated, the sheet was diverted into the shunt hopper, the program wrote an informational message to the operator's console, and the scanner stopped processing while the operator took appropriate action.

Each page of every booklet was printed with a set of identification marks next to the timing marks. The front cover of each booklet number had a unique set of these marks, and the pages within each block type were similarly identified by block code and sequence number. As the scanner read a booklet cover, the program identified the booklet number and referred to an internal table to determine which blocks were to follow and which page formats were within each block.

If a page sequence error was indicated, the operator instructed the program to treat the page as missing and placed the shunted page into the input hopper to be read again. If a page within a block was unreadable, the operator again instructed the program to treat it as missing and placed the sheet perpendicularly on top of the output stack. If a block sequence error or unreadable booklet cover was indicated, the operator instructed the program to insert a dummy record and removed the remaining pages of that booklet and placed them perpendicularly on top of the output stack.

As each batch completed scanning processing, it was removed from the output hopper and placed back in its capsule. The next batch was taken from its capsule and placed into the input hopper and the machine started again. When the last batch was completed, the operator terminated the program, dismounted the tape, and removed the listings from the printer.

The output data tapes were forwarded to the VAX computer area for loading processing. The scanned documents were returned in their original cartons to the resolution processing area.

6.1.4.3 Loading

The scanning tapes were received and checked in by an operator at the VAX computer area. The operator initiated the loading program by selecting the second option on the data entry menu.

The program's first input request was the tape number, a six-digit code printed on an external label on the tape and coded internally by the scanning program. The operator then mounted that tape on the tape drive and put the drive online. The program checked that the right tape had been mounted and proceeded with the loading process. As it processed the tape, the program printed the batch code and record count for each batch to the operator's terminal, to assure the operator that the program was running properly. When the program reached the end of the tape file, it printed out three listings, rewound and dismounted the tape, and returned to the main menu. The three listings consisted of an error log, a batch listing, and an audit listing.

The error log was a running commentary and summary of the processing of the tape. Each log was identified with the tape number, file name, and date of the loading run. The start of each batch was recorded with the batch number and its corresponding school and session codes. Any disagreement between these codes and those entered from the school worksheet was recorded at this point. Any booklets that did not belong to the session type (e.g., bridge booklets in a spiral session) were also listed here as well as all unscannable booklets. At the end of each batch, the number of scannable and unscannable booklets were printed.

The batch listing reported the information from the front cover fields of each booklet within each batch. This listing could be checked against the administration schedules for discrepant or missing information.

The audit listing identified the data problems found within each batch. Each data anomaly was identified by the batch sequence number, booklet number, section, and item number to facilitate location of the data in the raw instruments by resolution staff.

The printed output was forwarded to the resolution area to be joined with the scanned materials. The tape was retained in the VAX computer area.

6.1.4.4 Resolution Processing

The error log and batch listing were retained by the operations coordinator. The audit listings were separated by batch number and matched with the appropriate scanned materials. If the error log indicated any unscannable booklets within a batch, they were pulled and manually entered and verified through the data entry system. Upon completion of verification processing, the system produced an updated audit listing that replaced the one output from the load process.

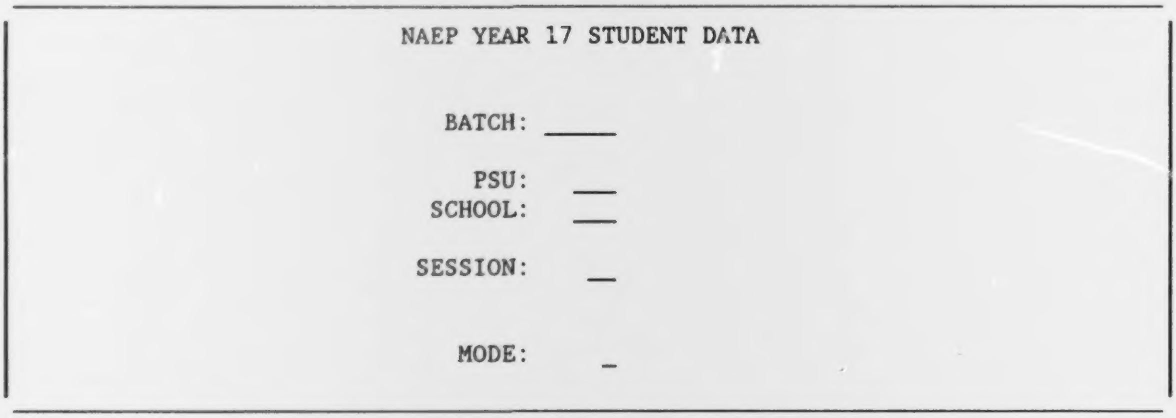
Staff assigned to resolution processing reviewed the audit listing, checked the actual responses in the booklets wherever asterisks or question marks were indicated, determined the appropriate value(s) to be coded in the data file, and wrote these new codes on the audit listing. The asterisks indicated multiple gridding of a single-response item; question marks flagged critical fields from the front cover, such as sex or birthdate, that were incorrectly gridded or out-of-range and fields from unscannable pages.

Access to the student data for entry, verification, or resolution processing was gained through the third option on the data entry menu. The first screen (Figure 6.1.4) requested the identification number of the batch to be processed; the PSU, school, and session codes as a secondary check on the batch; and a code for the processing mode. The second entry screen (Figure 6.1.5) prompted for input of the batch serial number and the student ID number as a secondary check.

If the program was in the entry mode and no data record for the booklet could be found, the program would set up to create a new record and request entry of the booklet cover data. If in verification mode and the data record had not been already verified, the program would request re-entry of the cover data and compare against the data record. If in resolution mode and the data record had been through verification or loading processing, all data fields were displayed and the operator could either modify these fields or advance to the rest of the entry screens for that booklet.

Figure 6.1.4

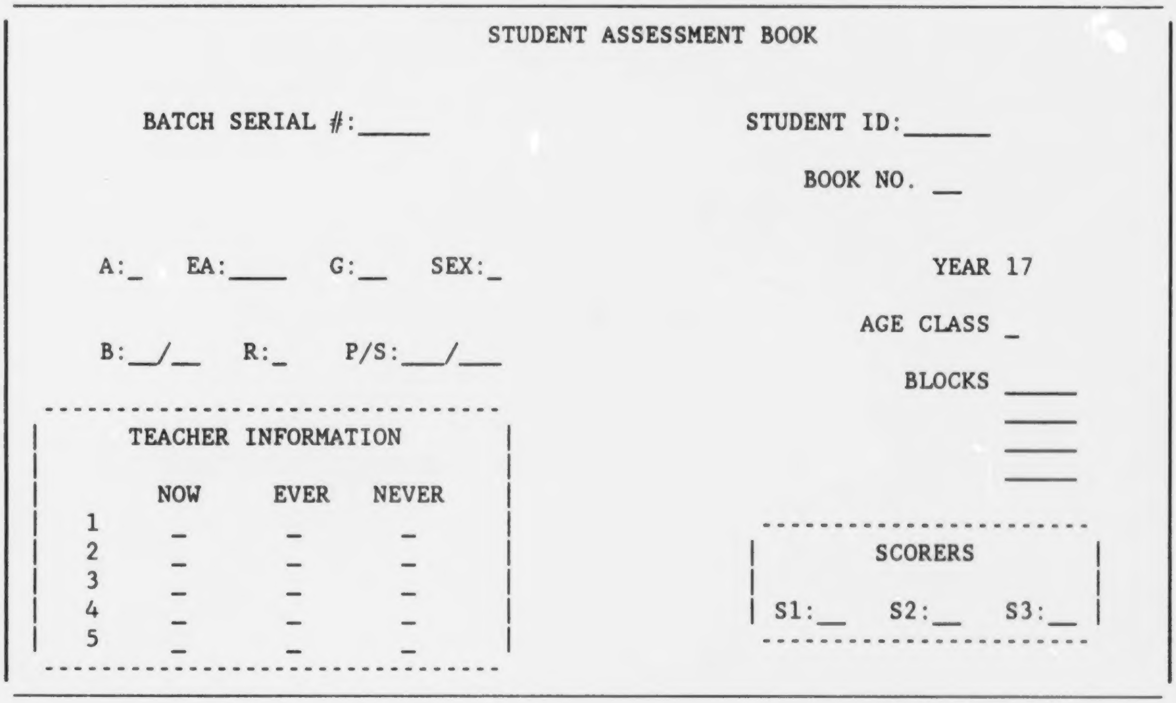
Student Session Data Entry Screen



```
          NAEP YEAR 17 STUDENT DATA


                BATCH: _____

                  PSU:   ___
               SCHOOL:   ___

              SESSION:    __


                 MODE:     _
```

Figure 6.1.5

Student Booklet Cover Data Entry Screen



```
                         STUDENT ASSESSMENT BOOK

   BATCH SERIAL #:_____                          STUDENT ID:______

                                                      BOOK NO. __

   A:_   EA:____   G:__   SEX:_                        YEAR 17

                                                   AGE CLASS _
   B:__/__   R:_   P/S:___/___
                                                      BLOCKS _____
 ------------------------------                              _____
|      TEACHER INFORMATION      |                            _____
|                               |                            _____
|        NOW     EVER    NEVER  |
|  1      _       _       _     |             ----------------------
|  2      _       _       _     |            |       SCORERS        |
|  3      _       _       _     |            |                      |
|  4      _       _       _     |            | S1:__   S2:__  S3:__ |
|  5      _       _       _     |             ----------------------
 ------------------------------
```

The resolution mode of the entry system permitted the operator to access data records, display the field values, and make corrections to individual fields. A change in any data field under resolution mode also generated a record for the audit file, and the program produced an updated audit listing at the completion of resolution processing for each batch. There was no limit to the number of times a session or data record could be processed under resolution.

On completion of resolution processing, each bundle was stored in a labeled box and held for final editing and quality control processing.

A final validation was performed when the data entry work files were spooled onto a master student data file. This spooling program checked every data field of every student record for out-of-range values and question marks. A listing similar to the audit listings for each session was produced, which resolution staff then used to identify and correct the remaining data anomalies.

The quality control process selected a random sample of each booklet type from the master student file, identifying those booklets for extraction from the raw data. The designated booklets were located, pulled from their boxes, and forwarded to quality control staff. The responses in each booklet were then compared with their coded data values in the data file. The full details and results of the quality control process are presented in Chapter 6.5. On completion of quality control processing, the booklets were returned to their boxes.

When open-ended items in an assessment also have been used and professionally scored in a previous assessment, a reliability check of the current scorers versus the previous scorers is required. To accomplish this task it was necessary to identify booklets that contained a block of items within the given subject area, extract the booklets from the spiral batches, and store them for future use. A computer program was developed to generate listings by age level of the booklets to be extracted. The listings contained the batch number, sequence number of the booklet within a batch, and the student booklet number. Operations staff went through each batch extracting the appropriate booklets and boxing them by subject area booklet type. These booklets were then shipped to the ETS data retention area for future use. At the completion of the operational process all remaining assessment booklets were shipped to the ETS data retention area for long-term storage.

6.1.5 QUESTIONNAIRES

The questionnaire instruments were separated by type and accumulated by the operations coordinator as they were received from mail processing. These data were also transcribed through the NAEP data entry system but on a lower priority basis than the student booklets. The excluded student questionnaires received higher priority than the teacher and school questionnaires, since the demographics of the excluded students were used in deriving the sampling weights of the assessed students. Every effort was made to keep the processing rate of these instruments in pace with the student data entry, in order to have the two files completed at the same time.

Processing of the questionnaire data was initiated by selecting the fourth option on the Data Entry menu. The first entry screen (Figure 6.1.6) prompted for input of the questionnaire type, age group, and processing mode. The questionnaire entry programs followed the same model as the student entry program with the absence of a tracking file and session batching. Entry, verification, and resolution modes were available; audit reports were initiated by the operations coordinator.

Figure 6.1.6

Questionnaire Data Entry Screen

```
                      NAEP YEAR 17 QUESTIONNAIRE MENU


       TYPE: _                  AGE: _                    MODE: _

    1  SCHOOL                1  AGE 9                  1  ENTRY

    2  TEACHER               2  AGE 13                 2  VERIFICATION

    3  EXCLUDED STUDENT      3  AGE 17                 3  RESOLUTION

                             4  COMPUTER COORDINATOR
```

The excluded student questionnaire entry program first displayed a screen for entry of the front cover data. The operator was prompted for the serial number of the booklet to be processed. An error condition occurred if either a record with that serial number was found under entry mode or no record was found under verification or resolution mode. In either case the operator was asked to verify that the correct number had been entered. If the problem persisted, it was referred to the operations coordinator for resolution. The remaining cover information, including PSU and school code, student sex, ethnicity, grade, and birthdate, were processed as for the student booklet covers. The program then displayed a single screen for processing the responses within the questionnaire. When the operator pressed ENTER to terminate processing for that booklet, the program redisplayed the cover entry screen, ready to process another booklet. A blank field entered in the serial number field returned the program to the primary menu.

The teacher questionnaire entry program first displayed a screen for entry of the cover information. It processed the serial number in the same fashion as did the excluded student questionnaire entry program. The cover information only included the PSU, school, and teacher codes. As the longest questionnaire instrument, the teacher questionnaire required three screens for entry processing due to software limitations as well as general appearance and ease of reading. Completion of processing for each booklet returned the program to the cover entry screen, where the entry of a blank serial number returned the program to the primary menu.

The school questionnaire entry program also started with a display of the cover entry screen. The only information requested for this instrument, however, was the PSU and school code, which also served as the booklet identification number. Due to the large number of questions in this questionnaire, entry processing required two screens. Completion of processing for each booklet returned the program to the cover entry screen, where the entry of a blank PSU and school code returned the program to the primary menu.

After all questionnaires had been received and processed through the entry system, a validation program was run against all data values in all records. All remaining data errors or discrepancies were then corrected using the resolution mode of the entry system. A final audit listing was generated, recording all entry activities for each questionnaire.

The questionnaires were subjected to the same quality control procedures that the student data received. The details of the sampling rates and results are discussed in sections 6.5.2 through 6.5.4.

At the completion of quality control processing, the questionnaires were packed into boxes and shipped to the ETS data retention area for long-term storage.

CHAPTER 6.2

Professional Scoring

Chapter 6.2

PROFESSIONAL SCORING

Anne Campbell

Educational Testing Service

The professional scoring of the 1986 NAEP assessment was conducted for open-ended reading, mathematics, science, and computer competence items from all three grade/ages. Three different groups of scorers were assigned to do the scoring: one group for mathematics, another group for reading and science, and a third group for computer competence. The two groups for mathematics and reading/science worked concurrently; a separate scoring operation was conducted later to score the open-ended computer competence items.

The 1986 NAEP assessment included 213 open-ended mathematics items: 37 at grade 3/age 9, 86 at grade 7/age 13, and 90 at grade 11/age 17. Of those items, 13 were used at both grade 3/age 9 and grade 7/age 13; 69 were used at both grade 7/age 13 and grade 11/age 17; and 6 were used at all three grade/ages. Also included in the assessment were 27 open-ended reading, science, and computer competence items as listed in Table 6.2.1. This table provides an overview of the items, including NAEP number, grade/age level, and score ranges.

The rest of this chapter will include a description of the scoring schemes and will discuss the scoring operation, including training, work flow, and reliability.

6.2.1 DESCRIPTION OF SCORING

6.2.1.1 Mathematics

All open-ended mathematics items were scored on a right-wrong basis: 1=correct; 2=incorrect (omitted responses were scored as 0). Answers written on the answer lines were the basis for the scores; however, if the student left the answer line blank, consideration was given to answers written under the problem or answers written where the student had figured out the problem. Scores were indicated by gridding in scoring ovals at the bottom of the page where each item appeared.

6.2.1.2 Reading

All open-ended cognitive reading items were scored according to criteria developed for each item. These criteria were defined to evaluate how well students responded to a reading passage when asked to perform such tasks as

Table 6.2.1

Distribution of Open-Ended Reading, Science and Computer Competence Items

Item Name	NAEP Item Number	Reading (R) Science (S) Computer(C)	Grade/Age 3/9	7/13	11/17	Primary Score Ranges	Secondary Score
Inside My Head	S007001	R	X	X	X	0-9	
Eggplant I	N021801-2	R		X	X	0-5,9	Yes
Eggplant II	N021805	R		X	X	0-4,9	
Goods to Market	N003100	R	X	X	X	0-5,7,8,9	
Jacob	N021301-2	R	X	X	X	0-4,9	Yes
Battery/Bulb	N413601	S	X	X		0-3,9	
Candle	N416701	S	X			0-2,9	
Circuit	N424802	S			X	0-3,9	
Hours of Daylight	N420701	S		X		0-3,9	
Liquids Freeze	N425701	S			X	0-4,9	
Pendulum	N430801	S			X	0-3,9	
Plant Cell	N431301	S			X	0-4,9	
Salt/Sand	N423201	S		X		0-4,9	
Snake/Mouse	N428201	S			X	0-4,9	
Sun/Moon	N434401	S	X			0-3,9	
2 Batteries/Bulb	N437001	S			X	0-4,9	
Cats and Dogs	N605301	C	X	X	X	0-3,9	
Computer 5 Times	N605701	C	X	X		0-3,9	
Logo Pictures	N609201	C	X	X		0-4,9	
Castle/Raccoon	N609602	C	X			0-3,9	
Jobs 1	S603401-2	C		X		0-9,99	Yes
Jobs 2	S603501-2	C		X		0-9,99	Yes
Quiz 1	N606101	C			X	0-3,9	
Quiz 2	N606102	C			X	0,1,3,9	
Quiz 3	N606103	C			X	0-3,9	
Basic Program	N608401	C			X	0-3,9	
Ace Computer	S604501	C			X	0-3,9	

identifying the author's message and substantiating their interpretation, predicting on the basis of the reading passage, supporting an interpretation, and comparing and contrasting. Criteria for each item were associated with specific score points in a scoring guide. The guides included score points of 0 to 4 or 0 to 5 and 9 (and in one case score points of 7 and 8). Readers assigned scores of 0 and 9 (and for the one exception, scores of 7 and 8) to responses that were blank, undecipherable, off-task, or contained a statement to the effect that the student did not know how to do the task. The remaining scores defined a continuum of success in completing the task, with a score of 1 indicating an unsatisfactory response and a score of 4 or 5 indicating a response that went beyond the essentials by providing more detail and being more coherent. (Note that because of changes in the way that scoring standards were applied, the 1986 results on item N003100, "Goods to Market," are not strictly comparable to the 1984 results.) Some items also required secondary scores, which generally involved categorizing the kind of evidence or details the student used as support for an interpretation. Primary and secondary scores were gridded in scoring ovals at the bottom of the page where each item occurred. One reading background item was scored according to a guide in which the score points categorized the type of response the student gave.

6.2.1.3 Science

The open-ended science items were also scored according to a rubric developed for each item. The criteria for each score point focused on how correctly the student answered the questions. With the exception of one item that was scored on a correct-incorrect basis, the scores for the items ranged from 0 to 3 or 0 to 4 and 9:

0,9: These scores were given to responses that were blank, undecipherable, off task or contained a statement to the effect that the student did not know how to do the task.

1: This score indicated an incorrect response to the question.

2: This score indicated an answer that was correct to a point but contained some misinformation or was too generalized.

3: This score indicated a correct answer.

4: This score, when present, indicated a correct, detailed answer.

Item scores were gridded in scoring ovals at the bottom of the page where each item occurred.

6.2.1.4 Computer Competence

The scoring of the open-ended computer competence items was a separate operation from the scoring of the other items. Most open-ended items were scored on a standard scale:

0 - No response
1 - An attempt was made, but incorrect
2 - A response indicating students had some idea of what they were doing
3 - Correct response
4 - Best possible response
9 - An "I don't know," off-task, or irrelevant response

Some (especially noncognitive items) were scored by grouping responses into various categories.

6.2.2 THE SCORING OPERATION

6.2.2.1 Scorers

Eight persons and one assistant scoring supervisor who also scored reading and science items were assigned to the scoring of the mathematics items at all three levels. These people had at least a high school education, and the assistant supervisor was an experienced mathematics teacher.

Seven persons and the scoring supervisor from the NAEP staff scored the open-ended reading and science items. Generally the readers had at least BA degrees in science, education, or English. The group included men and women of various ages who had lived in various parts of the country. One of the readers with a strong science background was designated as the science assistant responsible for reviewing discrepancies with science items.

Six persons and a NAEP staff member scored the open-ended computer competence items. A majority of the people were college students who were majoring in technical fields.

6.2.2.2 Training: Mathematics

Because the scoring for the mathematics items was on a right-wrong-omit basis, lengthy training was not necessary. The orientation to the scoring involved familiarizing the scorers with the procedures for scoring mathematics and with the mathematics guides, which consisted of a listing of the right answers for the items in each of the blocks.

6.2.2.3 **Training:** Reading and Science

Before training, the NAEP scoring supervisor, the assistant scoring supervisor, and the science assistant worked with NAEP test development staff to prepare training sets and to refine the scoring guides.

Training was done on all the reading and science items at all three grade/age levels. Training involved explaining the item and its scoring guide, discussing responses that were representative of the various score points in the guide, and then scoring and discussing approximately 65 to 100 randomly selected responses for the reading items and 25 to 50 responses for the science items. The purpose of the training was to familiarize the group with the scoring guides and to reach a high level of agreement among the scorers. After the group training was completed, each scorer scored the items in each of nine bundles of booklets. Their scores were recorded and a follow-up session was held to discuss those responses for which there was a wide range of scores. Once the follow-up session was completed, the scoring began. Initial training was completed in approximately one week.

As a follow-up to training, notes on various items were compiled and distributed to the readers for their reference. In addition, short training sessions were conducted when the scoring supervisor ascertained in reviewing discrepancies that particular items were presenting difficulties. The scoring supervisor also consulted with individual readers as the scoring progressed. When a reader was judged to be causing a discrepancy, the supervisor would discuss the response and its score with that reader.

6.2.2.4 **Training:** Computer Competence

Training for the computer competence items followed the same procedures as for reading and science. Short training sessions were also held whenever peculiar responses occurred that had not been covered in the initial training. The initial training lasted for one and one-half days.

6.2.2.5 **Assignment of Work:** Mathematics, Reading, and Science

Two separate groups of scorers were scoring simultaneously, one group scoring the mathematics items and the other group scoring the reading and science items. Batches of booklets were first scored by the reading/science readers and then sent on to the mathematics scorers. Both the mathematics scorers and the reading/science readers received the booklets in batches as they were received from the schools. A particular scorer scored either all the booklets in a bundle that had mathematics items or all the booklets that had reading and science items. Because of the spiral design, a scorer would encounter many, if not all, of the items at a grade/age level as he or she scored a batch of booklets. Furthermore, the scorers cycled themselves through the three grade/age levels so that the scorers had continual exposure to all items at all ages throughout the scoring.

The 1986 assessment included one open-ended reading item that had also been administered in 1984. To ensure consistent scoring across assessments, the 1986 readers were trained on sample responses from both the 1984 and the 1986 assessments. Then, to check for reliability, a 20 percent subsample of the 1984 responses was retrieved, the scores were masked, and the responses were distributed to and rescored by the readers. This rescoring was performed concurrently with the scoring of the 1986 responses.

6.2.2.6 Assignment of Work: Computer Competence

For the scoring of the computer competence items, the booklets with those items were sorted by booklet number and then batched in bundles of 25. A scorer then scored all the items in all the booklets in a particular bundle. Scorers also cycled themselves through the booklets at the various grade/age levels to ensure consistency in scoring overlap items. Those scorers with minimal computer programming background, however, did not score the programming items at grade 7/age 13 and grade 11/age 17.

6.2.2.7 Reliability and Resolution

Ten percent of the mathematics items were subject to a correctness check, in which a second scorer checked to see that the first scorer had correctly scored the items. If the second scorer found a mistake in scoring, he or she corrected it. To keep track of the reliability of each scorer, the second scorer kept a tally of how many items he or she checked each of the other scorers and a tally of how many times he or she had to correct a score. This procedure was followed because the mathematics scoring was done on a right-wrong-omit basis and because the scoring guides were exact as to the correct answers. Results of this correctness check showed that the first scorer was correct 99 percent of the time.

Twenty percent of the reading and science items were subject to a reliability check, which entailed a second reading by a different reader. To prevent a second reader from being influenced by the first reader's scores, the first reader masked all the scores in every fifth booklet in a batch. These booklets were passed along to a second reader. All discrepancies were then reviewed by the scoring supervisor or science assistant.

The same general procedures were followed for the computer competence scoring: twenty percent of the responses were rescored; second scorers did not see the first scores; discrepancies were checked by the scoring supervisor.

In analyzing reader reliability, two statistics were chosen: the percent of exact agreement and the reliability coefficient. The percent of exact agreement is the percentage of times that the two readers agreed exactly in their ratings. The reliability coefficient is the intra-class correlation among readers. The results for each grade/age are shown in Table 6.2.2. The number of responses analyzed is indicated first; the second

Table 6.2.2

Percentages of Exact Score Point Agreement and Intraclass Correlation Coefficients for 1986 Open-Ended Reading, Science, and Computer Competence Items

	Grade 3			Grade 7			Grade 11		
Item Description	N	P Agree	Rel.	N	P Agree	Rel.	N	P Agree	Rel.
EGGPLANT I				394	0.98	0.99	377	0.98	0.99
EGGPLANT II				300	0.93	0.92	313	0.97	0.94
GOODS	448	0.96	0.96	338	0.94	0.95	367	0.91	0.95
JACOB	437	0.97	0.97	470	0.95	0.98	404	0.94	0.98
BATTERY/BULB	571	0.99	1.00	584	0.99	1.00			
CANDLE	494	0.99	0.99						
SUN/MOON	525	0.99	0.99						
CIRCUIT							512	0.99	0.99
HOURS OF DAYLIGHT				582	0.99	0.99			
LIQUIDS FREEZE							479	0.99	0.99
PENDULUM							535	0.98	0.99
PLANT CELL							515	0.99	1.00
SALT/SAND				603	0.99	0.99			
SNAKE/MOUSE							528	0.99	0.98
2 BATTERIES/BULB							512	0.99	0.99
CATS/DOGS	335	0.97	0.96	405	0.97	0.97			
COMPUTER 5 TIMES	279	0.98	0.97	427	0.98	0.97			
LOGO PICTURES	115	0.96	0.98	345	0.98	0.98			
CASTLE/RACCOON	274	0.93	0.94						
QUIZ I							396	0.97	0.98
QUIZ II							396	0.98	0.97
QUIZ III							337	0.99	0.99
BASIC PROGRAM							313	0.98	0.97
JOBS 1 - WHICH JOB				433	0.98	0.98			
JOBS 1 - HOW COMPUTERS USED				433	0.93	0.92			
JOBS 2 - WHICH JOB				432	0.98	1.00			
JOBS 2 - HOW COMPUTERS USED				432	0.93	0.93			
ACE COMPUTER							367	0.95	0.96

Note: Since the standard errors of P Agree are about .01, a reasonable part (perhaps 1/9) of item-to-item differences are due to sampling variability.

column is the percent of exact agreement; and the third column is the reliability coefficient.

These results show a very high degree of agreement between readers. Table 6.2.3 summarizes the statistics by grade. For all three grades no exercise had less than 91 percent exact agreement; several items had agreement as high as 99 percent. The reliability coefficients are also high, ranging from .92 to 1.00.

Table 6.2.3
Reliability Statistics for Scoring of Open-Ended Items

Grade	Number of Exercises	Low Percent	High Percent	Low r	High r
3	9	93.1	99.6	.94	1.00
7	14	93.3	99.5	.92	1.00
11	16	91.0	99.4	.95	1.00

6.2.2.8 Data Entry

When the professional scoring was completed, the batches of booklets were sent to scanning. (See Chapter 6.3 for details concerning the scanning process and Chapter 6.4 for information concerning editing data.)

CHAPTER 6.3

Data Transcription Systems

Chapter 6.3

DATA TRANSCRIPTION SYSTEMS

Alfred M. Rogers

Educational Testing Service

The transcription of the student response data into machine-readable form was achieved through the use of three separate systems: scanning, loading, and resolution.

The student instruments were printed in scannable format to allow the transcription of marked responses in the booklets to computer-readable form on a magnetic tape by a programmable optical scanning machine. The first part of this chapter will describe the scanning equipment, the programs and data used by the machinery, and the ETS quality control standards and procedures.

The data contained on the scanning tapes were edited and loaded into an online data entry and resolution system similar to that used in the 1984 assessment. This loading procedure validated each scanned data field, reformatted the data records to be compatible with the resolution system, and reported all problems for subsequent resolution. The second part of this chapter details the loading procedure.

A modified form of the data entry system developed for the 1984 assessment was used for resolution of the scanned data, entry of the documents rejected by the scanning machine, and entry of the questionnaire instruments. The third part of this chapter will provide an overview of this system, which is fully described by Rogers (1987).

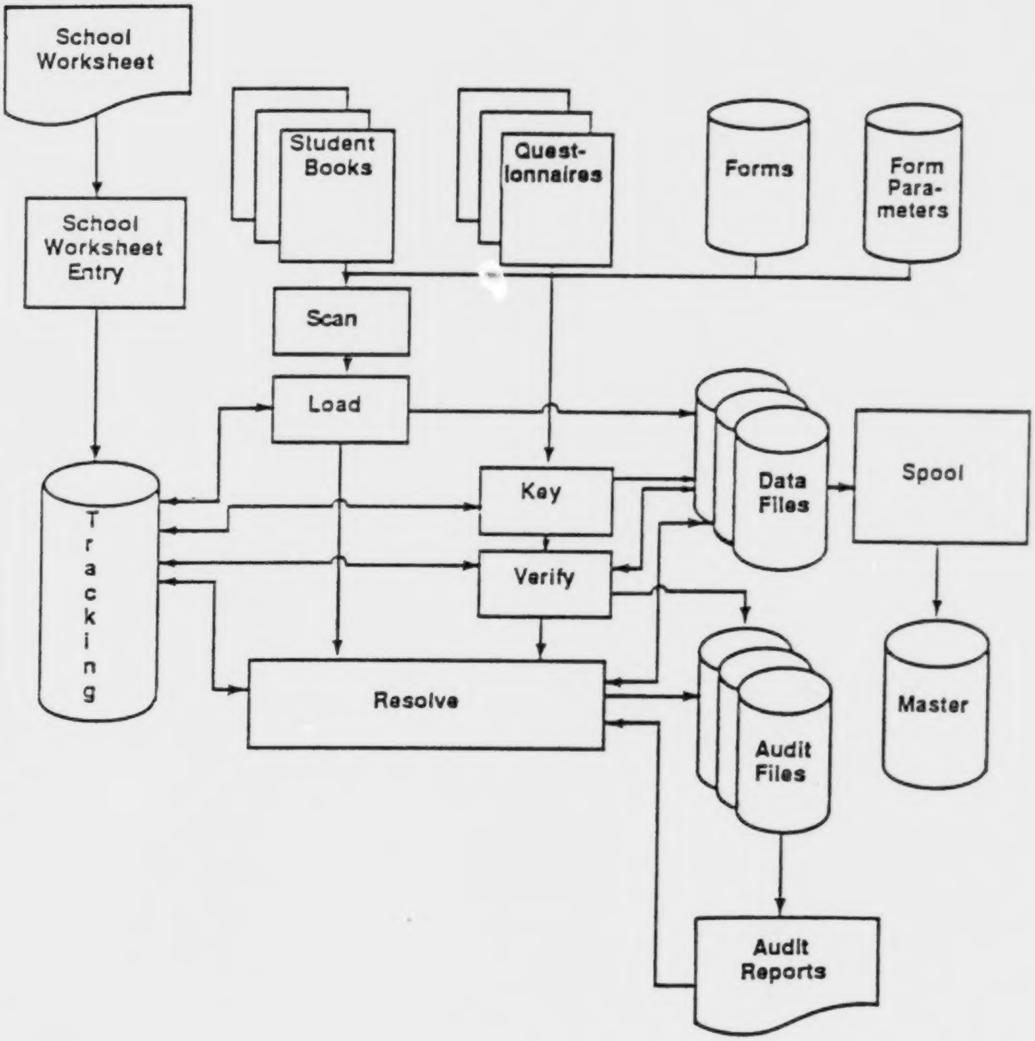
Figure 6.3.1 is a schematic diagram that represents the flow of student assessment materials through the data transcription system. The reader may refer to this diagram for clarification of the relationships among the components of this system.

6.3.1 SCANNING

The student booklets were scanned on a National Computer System W201 scanning system. The scanner was controlled by a Hewlett Packard 1000 minicomputer. This system also included a disk drive for storage of the scanning programs, a tape drive for the output of scanned data records, and a printer for the periodic dumping of records for quality control checking. The scanning programs used were specifically written for NAEP using the assembler language of the Hewlett Packard.

Figure 6.3.1

Intelligent Data Entry System


School Worksheet
Student Books
Quest-ionnaires
Forms
Form Parameters
School Worksheet Entry
Scan
Load
Tracking
Key
Verify
Data Files
Spool
Resolve
Audit Files
Master
Audit Reports

An optical scanner operates by sweeping a horizontally oscillating light beam across a vertically moving sheet and detecting reflections of the beam from pencil marks. The hardware logic of the scanner treats the page as a rectangular array of scannable areas, each of which is assigned a reflectance value from 0 to 15. This array of values is passed to the scanning program software, to be translated into response data.

After the first side of a sheet has been scanned, it is pushed through a loop that brings the other side of the sheet to face the scanning beam. A similar array of reflectance values is passed to the program that must then not only translate it into data, but decide whether to route this page to the output hopper and read in the next sheet or route it to the shunt hopper and stop processing.

The paper and inks used in producing scannable documents are required to have very low reflectances. A special set of marks were printed down one side of each page at equally spaced intervals to enable the scanning hardware to align each sheet and adjust the scanning rate to the movement of the sheet. These timing marks were printed using a highly reflective ink.

Each page of each item block had its own unique format in terms of the arrangement of the response and scoring bubbles. The scanning program had to be able to identify a given page, determine which parts of the returned array to process, interpret the reflectance values, and transcribe them to data codes on the output record. Each page was printed with a set of marks next to the timing marks that were used by the program to uniquely identify it by block code and page number. The booklet covers were similarly identified according to booklet number.

The scanning program logic used two sets of tables to control scanning processing. When a booklet cover was scanned, the program used the booklet number and the first table to determine which blocks were to be processed. Each block code, in turn, was referred to the second table to determine the number, formats and sequence of its constituent pages. By reading the booklet cover, the program "knew" which pages would follow and in what order.

The scanning program rejected pages for one of two reasons: unreadable or out of sequence. A page was unreadable if the timing or identification marks had been corrupted by either tearing, improper trimming, or confusing stray pencil marks. If the unreadable page happened to be a booklet cover, the operator would instruct the scanner to pass the remaining pages up to the next booklet cover into the shunt hopper, place the pages perpendicularly on top of the output stack, and resume processing with the next booklet. For any other page type, the operator instructed the program to substitute question marks for the data values for that page and proceed with the next page.

Pages out of sequence were generally attributable to collating errors in printing. When the program encountered this type of error, the operator would direct the scanner to shunt the remaining pages of the booklet and then place them perpendicularly on the output stack.

The scanning program wrote three types of data records onto the magnetic tape. The first was a batch header record, containing information gridded onto the batch header sheet by receipt processing staff. The second was a data record containing all of the translated marked bubbles from all pages within a booklet. The third type was a dummy data record, serving as a place holder in the file for a booklet with an unreadable cover sheet. The origin code was a data field written in the same location on all records to distinguish them by type.

The batch header record preceded all data records for a given batch. As the scanning program processed the header sheet, it retained the batch identification code and initialized a batch sequence number to one. The batch identification code and sequence number were written to each record; the batch header record always received a sequence number of one, the first data record was assigned number two, and so forth. The scanning machine was directed to stamp the batch identification code and sequence number on each page of a booklet. This greatly facilitated the location of individual pages within batches by resolution staff.

Each data record was formed by collecting the transcribed marked bubbles from each page of a booklet, placing them into a buffer area within the program, and writing the buffer to tape when the last page of the booklet had been processed. Several options were considered in designing the format of the output data records. One which required a fixed column position for each item response value would have been very large due to the number of items in the assessment, and very sparse, due to the BIB spiral design. Another which had the response data strung out in contiguous fields across items and blocks was more consistent with the format of the data records in the NAEP data entry system, but would have been difficult to check in listings for quality control. The format adopted for this assessment had fixed column positions for the booklet cover data fields and scorer identification codes. The response data started at fixed positions for each positional block, with the item responses in contiguous fields.

The data values from the booklet covers and scorer identification fields were coded as numeric data. Unmarked fields were coded as hyphens (-) except for the race, sex, grade, and birthdate fields, which were returned as question marks (?) to alert processing staff of missing or uncoded critical data. Fields that had multiple marks were coded as asterisks (*). The data values for the item responses and scores were returned as alphabetic codes. The multiple-choice, single-response format items were assigned codes depending on the position of the response alternative; that is, the first choice was assigned the code "A", the second "B", and so forth. The circle-all-that-apply items were given as many data fields as response alternatives; the marked choices were coded as "A" and the unmarked choices as hyphens. The open-ended items had 10 bubbles labeled from zero to nine; a marked zero was coded as "A", a marked one as "B", and so on up to "J". As with the cover data fields, unmarked responses were coded as hyphens and multiple marks as asterisks. The fields from unreadable pages were coded as question marks again as a flag for resolution staff to correct.

6.3.2 DATA LOADING SUBSYSTEM

Each magnetic tape produced by the scanning system contained data for one or more assessment sessions for one of the age groups. The data records on these tapes conformed to a fixed format. This data now had to be edited for type and range of response, transformed to a compressed format compatible with the data entry system files, and loaded into the database for resolution processing. A procedure for accomplishing all of these tasks was designed and developed for this assessment.

The data records on the scanning output tape were ordered in the same sequence as the paper materials were processed by the scanner. A record for the batch header preceded all data records belonging to that batch; each set of records belonging to one batch were separated from the others by its batch header record. The origin code field on each record served to distinguish the header records from the data records.

The processing of each batch began with the identification of the header record. The batch identification number on this header record provided the link between the subsequent data records on the tape and the tracking file generated by the school worksheet entry program in the data entry system. The load program used the batch identification number to locate and retrieve the processing information for that batch from the tracking file. The program then verified that it had the correct batch by comparing the PSU, school, and session codes gridded on the header record with the same codes in the tracking record.

If a batch code could not be located in the tracking file, the program would generate a new tracking record, using only the information contained on the header record, and record this condition on an error log file. If a batch code could be located but the school or session codes did not agree, the program would record this conflict in the error log and continue processing.

The batch header record also contained the date that the session materials were batched together, and the number of booklets batched by the receipt processor. This information was transferred to the tracking record for later processing and reporting.

The reading of a batch header record also initiated the generation of two new files in the entry system database: the data file and the audit file. As the program processed each record within a batch from the tape file, it would write the edited and reformatted data records to the data file and record all errors and special codes in the audit file. The data fields on an audit file record identified each data problem by the batch sequence number, booklet serial number, section or block code, field name or item number, and data value. The program would generate a listing of the data problems after each batch had been processed, to be printed at the termination of the program.

As the program processed each data record it would first read the booklet number and check it against the batch session code for appropriate session type (bridge or spiral). A mis-match was recorded in the error log and processing continued. The booklet number was then compared against the first two digits of the student identification number. If they disagreed, due to improper gridding, a message was written to the error log and the booklet number was substituted into the student number. The remaining booklet cover fields were then read in and validated for range. The PSU and school codes were compared against those from the tracking record; the range of grade codes was dependent on the age cohort being processed; and the range of birth dates was dependent upon the session type as well as the age cohort. All data values that were out of range were replaced with question marks and recorded on the audit file. All data fields that were read in as question marks or asterisks were also recorded in the audit file. The booklet cover data fields were written to a batch listing file that would be printed at the end of load processing. This listing could be compared against the administration schedule to assist in resolving booklet cover data problems.

The processing of the scorer identification code fields was not as straightforward. If a booklet contained any open-ended mathematics items, the first scorer field should have been filled. If it contained any open-ended reading or science items, the second field should have been filled and the third may have had data if it had been part of the reliability sample. The program had to determine from the booklet number whether the booklet contained any open-ended items and of what type. It would then flag as erroneous any incomplete field that should have been filled, or any nonblank field that should have been empty and record the error in the audit file. Further, it would remember how many scorer fields of each type were marked for later processing of the open-ended item scores.

The edited booklet cover and scorer identification fields were appended to the batch sequence number and transferred to an output buffer area within the program. As the program would process each block of data from the tape record, it would append the edited data fields to the data already in this buffer. The output data record, in this "compressed" format, was compatible with the NAEP data entry system.

The program was now prepared to cycle through the data areas corresponding to the item blocks. The task of translating, validating, and reporting errors for each data field in each block was performed by a subroutine that required only the block identification code, the string of input data, and the number of scorers who gridded the appropriate identification fields for that block. This routine had access to an internal table that had, for each block, the number of fields to be processed, and, for each field, the field type (alphabetic or numeric), the field width in the data record, and the valid range of values. The routine would then process each field in sequence order, performing the necessary translation, validation, and reporting tasks.

The first of these tasks was checking for the presence of hyphens, asterisks or question marks. Fields containing asterisks and question marks were recorded in the audit file and processing continued with the next field.

No action was taken on hyphen-filled fields as that code indicated nonresponse. The field type code dictated whether numeric or alphabetic codes were to be output for a data field. The next step examined the type code and translated the input data from alphabetic to numeric if so indicated. The field was then validated for range of response, recording anything outside of that range to the audit file. The field type code made a further distinction among open-ended item scores and other numeric data fields. If the data field was an open-ended item the routine used the passed value of the number of scorers to determine if a score should have been marked. If no scorer codes were indicated and the item was marked, or a scorer code was gridded and the item was not marked, the discrepancy was noted in the audit file. If the current block was either a reading or science block, the routine would look ahead to the next field for a secondary scoring and compare its presence against the absence of a second scorer code and vice versa and again record a discrepancy in the audit file. Moving the translated and edited data field into the output buffer was the last task performed in the processing loop.

The routine passed the edited data string back to the program, which then appended it to the current output buffer and set up to process the next block within the booklet. The completed string of data was written to the data file, using the batch sequence number as the key for direct access by the entry system programs.

When the next batch header record or end of file was encountered, the data and audit files were closed, an audit listing was generated, and a count of the number of records processed written to the message log. The tracking record for that batch was updated with the current date and time and the record count, then rewritten to the tracking file.

When the end of file was reached, the program closed and rewound the tape file, closed the tracking file, and spooled the message log, the audit listing, and the batch listing to the printer.

6.3.3 DATA ENTRY AND RESOLUTION SYSTEM

The resolution program was essentially the same program used in the 1984 assessment (see Rogers, 1987) for data entry, modified to accommodate changes in the assessment design and data entry operations.

The 1984 entry system was set up to process each age group separately, as the administration periods for each were nonoverlapping. There were three sets of programs, three tracking files, and three areas for the data and control files. The main part of the 1986 assessment, however, was administered to all three age groups at the same time. The new system now had to be able to process the materials from these groups simultaneously: one set of programs using a single tracking file to control processing for three data areas.

The program structure of the system itself was broken down into separate programs for each main function (school worksheet entry, student data entry/resolution, and questionnaire entry/resolution), to permit the modification or enhancement of one component while allowing the others to operate. Access to these programs was controlled through a menu-type procedure written in the VAX command language and using screen control directives.

The tracking files in the 1984 entry system used the session identification code as the index key for direct access to session information. This proved to be an unfortunate choice for the few times that the session code was entered incorrectly from the worksheet entry program. If a session code had to be changed, both the tracking record and the file names of the associated data and audit files had to be modified, requiring special programming. The adoption of a batch identification code as the index key for the 1986 entry system tracking file permitted changing the session codes without impacting other parts of the system.

A related problem frequently occurred under the 1984 entry system with regard to the student identification numbers in each batch data file. These codes were used as the index key for direct access of the student data records and an erroneous code was difficult to correct. In anticipation of the many types of problems involved in accurately gridding the student identification numbers and transcribing them through the scanner, the batch sequence number was adopted as the key for the batch data files in the 1986 entry system. This number was generated by the scanning program, written to each record on the scanning output file, and, by its nature, nonredundant.

Another addition to the batch data records was the data entry status codes. The records in a batch file were generated in one of two ways: the tape loading program or manual entry of the booklets rejected by the scanner. The manually entered records had to undergo the two-step entry and verification processes. Due to the high accuracy rate of the optical scanner, the loaded records were treated by the system as if they had been through verification. The entry status code was used to distinguish between records that were undergoing manual processing and those that were loaded. The code on each record was tested and set by the different processes: entry, verification, loading, and resolution. Since each record contained its own status code, it was no longer necessary to maintain a vector of booklet counts on the tracking record as in the 1984 system.

The form parameters, which controlled processing of each data entry screen, were maintained in a text library. Each set of parameters for each form were stored as a separate member or subfile within this library. This format permitted easy extraction, modification and replacement of parameter information as well as faster access by the entry programs. A set of programs were developed to facilitate the entry, documentation, and editing of the form parameter data.

The teacher questionnaires for the two older grade/ages contained separate content-related sections of questions within and a corresponding set of boxes on the front cover. The teacher filling out a questionnaire was supposed to indicate the subject taught for that grade/age: reading, mathematics, or science at grade 7/age 13 and reading, mathematics, science, or history at grade 11/age 17. The teacher questionnaire entry program was enhanced to accept the subject code and display the appropriate form for the entry of responses to the questions for that subject.

CHAPTER 6.4

Editing Data

Chapter 6.4

EDITING DATA

Alfred M. Rogers

Educational Testing Service

The data editing process is divided into three separate steps: validation, identification, and correction. Validation ensures that each data value in the computer file is of the correct type, is within a range or set of ranges of values, and is consistent with other data values. All invalid data values are then identified and located in the raw data. The erroneous data are then either corrected or flagged as unresolvable in the computer file.

The errors uncovered by the editing process fall into two types: those made by the respondent (e.g., choosing two responses for a multiple-choice exercise requiring only one response) and those made by data entry. The validation process reports both types of error with no knowledge of their source. The identification process determines the type of each error. The data entry errors are, for the most part, correctable; the correct value can be determined from an examination of the raw data. Errors made by the respondent, however, are difficult, if not impossible, to correct. If the intent of the respondent cannot be determined, the error must remain unresolved, but be flagged in some way to prevent incorrect interpretation in analysis and reporting procedures.

6.4.1 ABSENTEE DATA

As described in section 6.1.2, the absentee data were transcribed by ETS key entry systems from the administration schedules. Key entry operation standards required that all data be entered and verified. Verification consisted of a blind second entry of each data record, comparing each data value with the original entry. This procedure ensured the highest likelihood of correctly transcribing the data.

The output data files were transferred to disk where the data values could be validated by specific programs and corrected through the use of an online editor. Validation consisted of matching the school and session codes with those in the tracking file and checking that the sex, grade, and birth date codes were within the appropriate ranges for age cohort and session type. A further check performed on these files compared the number of absentee records within each session against the absentee count field on the corresponding tracking record.

The online text editor proved to be the easiest and most efficient method of correcting most, if not all, of the errors. The editor had the facility for locating specific records, writing over the incorrect field with its correct value, and performing global substitution of systematic data errors, such as incorrect school code, over one or more records.

The corrected file was again processed by the validation program to ensure that all errors had been fixed and that no new problems were created in the process. If more errors were uncovered, the cycle of identifying the records, correcting the errors, and validating the corrected file was repeated until no more errors were found. At this point, the absentee file was ready for transmittal to Westat for sampling weight estimation.

6.4.2 STUDENT DATA

The introduction of scannable materials to the 1986 assessment greatly improved the efficiency and accuracy of the transcription process by removing the possibility of human error. The scanning machinery was programmed to detect the marked responses in unique and fixed positions on each page; erroneous and out-of-range response codes could not be generated.

On the other hand, removing human intervention as a source of error also prevented the exercise of human judgment when more than one mark was detected for a single-response item. This would commonly happen when a subject marked a second response without erasing the first, or misinterpret the question as a "circle all that apply"-type response. Neither the human eye nor the scanning equipment can determine the student's intent in such a situation. However, if the student had incompletely erased the first response, or inadvertently made a stray mark on one of the bubbles, the scanning program would also return a multiple response code where a human eye could determine the intended response. Hence there were proportionally many more multiple response codes produced by the scanning process in 1986 than by the manual entry process in 1984.

Furthermore, collating errors in the printing of the booklets resulted in both missing and multiple pages, which the scanning program was unprepared to handle. A new code was appointed and used to designate responses to items from pages that were missing or otherwise unscannable.

Every multiple response code and unscannable page code had to be checked against the raw data and, where possible, corrected by resolution operators. At the completion of resolution processing, all of the batch student data files were spooled onto a single master file in preparation for transfer to the IBM mainframe. A second validation was performed during this spooling process to catch errors that had "slipped through" the entry system. An editing program was developed for applying corrections to this master file, using the same methodology as for the data entry program. This master file also served as the basis for preliminary descriptive data analyses and quality control checks.

6.4.3 QUESTIONNAIRE DATA

The data entry system was used for the entry of questionnaire data and served as the first line of defense against bad data. As described above, all data values were validated for type and range as they were entered from the data terminal keyboard. Special codes assigned for multiple and indeterminate responses were recorded and reported via the audit trail. The indeterminate values were later corrected under the resolution process.

The questionnaire files received the same secondary validation processing as the student data. Special attention was given to the "circle all that apply" items to ensure consistency in the coding of responses: if a respondent circled one or more of the alternatives, those would be coded "1" while the rest would be coded "0"; if no alternatives were marked, yet the respondent had the opportunity to reply, all fields would be coded "0"; if no alternatives were marked and the respondent had not reached the item or was instructed to skip it, all fields would be coded as "no response".

6.4.4 PROFESSIONALLY SCORED ITEMS

The open-ended reading, mathematics, and science item responses were read and scored prior to scanning processing. Their data values were subject to the same editing procedures as the multiple-choice item responses. The open-ended computer items, however, were not scored until after scanning and resolution processing. It was neither feasible nor economically prudent to enter so few scores for each booklet through the entry system, therefore this data went through a separate entry and editing process.

Special forms were designed and printed for each age group for the scoring of the open-ended computer items. As each booklet was scored, the student ID number, birth date, and PSU and school codes were transferred to the form. The first set of scores were written into the appropriate boxes for the items in that booklet. Every fifth line on the form had boxes for the entry of the second reader's scores, ensuring a 20 percent rater reliability sample.

These forms were batched and forwarded to ETS key entry systems where they were entered, verified, and transcribed to magnetic tape. These tape files were loaded onto the VAX computer system where specially written validation programs performed thorough checks on the data values. An online text editor was used to make corrections to the data and the validation programs run again. When all of the items had been scored, entered, validated, and corrected, the data files were transferred to the IBM mainframe system for merging with the student database.

6.4.5 CONCLUSION

Before the NAEP data entry methodology was developed, the editing process for any data file proceeded in the same manner as for the absentee data and professionally scored computer items. The validation process was especially inefficient because it was performed after the fact of transcription and often by a second party who did not have immediate access to the raw data. Putting the validation mechanism at the point of entry removed most, if not all, of this inefficiency by informing the entry operator of a possible keying error while the raw data value was accessible.

The editing process does not guarantee that all errors are removed from the data; only that the invalid, inconsistent, or otherwise unreasonable values have been at least identified, if not corrected. If a data value has been miskeyed during the entry process and meets the validation criteria, this error could persist through the editing process to the analysis stage without detection. The verification process detects most of these errors by comparing independent entries of the same data and reporting discrepancies. The likelihood of an error surviving verification is thus very small, but still present. A quality control process must follow the entry and editing processes to ensure that the data values in a given record agree with the responses in the corresponding instrument.

CHAPTER 6.5

Quality Control of Data Entry

Chapter 6.5

QUALITY CONTROL OF DATA ENTRY

John J. Ferris

Educational Testing Service

The purpose of this work was to assess the accuracy of the NAEP 1986 data entry operation, or how closely the contents of the various instruments matched the corresponding data in the resulting datasets that were analyzed. A more complete discussion of the general approach taken to quality control can be found in Chapter 10.5 of the Technical Report for the 1984 assessment. Following are the detailed results of the quality control operation for each of the 1986 instruments; a table at the end of this chapter summarizes the findings.

6.5.1 STUDENT DATA

A total of 213 different booklets was used for the student assessment across the three cohort levels. These booklets were designed to be machine-scanned, but not all booklets were received in scannable condition. Those that could not be scanned had to be keyed by hand.

One of each of the 213 different booklets from among those that were scanned was selected for analysis. In addition it was considered prudent to treat the hand-keyed booklets as an independent pool; therefore, one each of them was also selected for quality control analysis. The booklets that belonged to the Language Minority Probe in this assessment were not considered independently since the booklets used were the same and the data entry process was the same.

At Age 9,	52	booklets were checked out of	37,401	scanned;
	52	" " " " "	1,068	keyed.
At Age 13,	68	" " " " "	43,900	scanned;
	68	" " " " "	886	keyed.
At Age 17,	93	" " " " "	48,164	scanned;
	93	" " " " "	1,162	keyed.
TOTALS:	213	scanned booklets were checked	(0.16 percent)	
	213	keyed " " "	(6.8 percent)	

As expected, the scanned booklets were much more accurately captured by the data entry process; only one "error" was discovered in all 213 of these booklets, the pickup of an erasure. In the group of keyed booklets examined, a total of 11 keystrokes were wrong. The total number of keystrokes in a full set of 213 booklets was 42,366.

6.5.2 EXCLUDED STUDENT QUESTIONNAIRE DATA

Excluded student questionnaires were randomly sampled at the rate of 2.5 percent, the same rate used in the 1984 assessment:

At Age	9,	53	booklets checked out of	2151	
" "	13,	64	" " " "	2595	
" "	17,	61	" " " "	2465	
TOTALS:		178	" " " "	7211	(2.5 percent)

No errors at all were found among these 178 booklets, which involved a total of 16,020 keystrokes.

6.5.3 TEACHER QUESTIONNAIRE DATA

Teacher questionnaires were randomly sampled at the rate of 2.5 percent, or approximately one booklet out of 40.

At Age	9,	19	booklets checked out of	789	
" "	13,	19	" " " "	800	
" "	17,	29	" " " "	1244	
TOTALS:		67	" " " "	2833	(2.4 percent)

A total of 25,809 keystrokes was involved in this sample of teacher questionnaires. One of these keystrokes was in error.

A separate teacher questionnaire was administered as part of the Language Minority Probe in the 1986 assessment. These booklets were sampled at about the same rate.

At Age 9,	4	booklets checked out of	168	
" " 13,	3	" " " "	135	
" " 17,	2	" " " "	92	
TOTALS:	9	" " " "	395	(2.3 percent)

A total of 1,589 keystrokes was involved in this sample of teacher questionnaires. One of these keystrokes was in error.

6.5.4 SCHOOL CHARACTERISTICS QUESTIONNAIRE DATA

School characteristics questionnaires were randomly sampled at the rate of 5 percent, or one booklet out of 20.

At Age 9,	29	booklets checked out of	598	
" " 13,	26	" " " "	531	
" " 17,	20	" " " "	402	
TOTALS:	75	" " " "	1531	(4.9 percent)

A total of 18,739 keystrokes was involved in this sample of school questionnaires. Two of these keystrokes were in error.

A separate school questionnaire was administered as part of the Language Minority Probe in the 1986 assessment. These booklets were sampled at about the same rate.

At Age 9,	5	booklets checked out of	106	
" " 13,	3	" " " "	50	
" " 17,	3	" " " "	26	
TOTALS:	11	" " " "	182	(6.0 percent)

A total of 7,029 keystrokes was involved in this sample of school questionnaires. No errors were found.

6.5.5 COMPUTER COORDINATOR QUESTIONNAIRE DATA

Computer coordinator questionnaires were randomly sampled at the rate of 5 percent, or one booklet out of 20.

At	Age	9,	13	booklets	checked	out	of	250	
"	"	13,	14	"	"	"	"	287	
"	"	17,	17	"	"	"	"	336	
TOTALS:			44	"	"	"	"	873	(5.0 percent)

A total of 8,316 keystrokes was involved in this sample of computer coordinator questionnaires. Two of these keystrokes were in error.

6.5.6 SUMMARY OF RESULTS

The quality control of the NAEP data for 1986 showed extremely high standards of data entry. The use of scannable booklets contributed to the improvement of what had already been a very high quality of data entry in the 1984 assessment (see Ferris, 1987). Two values are tabled below, the observed error rate and the upper bound of the 99.8 percent confidence interval.

Table 6.5.1

Observed Error Rate and Upper Confidence Limit, by Instrument

INSTRUMENT	OBSERVED ERROR RATE	UPPER 99.8% CONFIDENCE LIMIT
Student Data including Language Minority - scanned (97.7 percent of books)	.00002	.0002
Student Data including Language Minority - keyed (2.3 percent of books)	.00026	.0005
Excluded Student Questionnaire	zero	.0004
Teacher Questionnaire	.00004	.0003
Language Minority Teacher Questionnaire	.00065	.0055
School Questionnaire	.00011	.0006
Language Minority School Questionnaire	zero	.0015
Computer Coordinator Questionnaire	.00024	.0013

Note: An error was discovered in the computation of the corresponding values for the student data in the 1984 assessment. The correct values for that assessment are:

Student Data	.00006	.0003
(not as reported:	.00002	.0001)

CHAPTER 6.6

Database Creation

Chapter 6.6

DATABASE CREATION

Alfred M. Rogers

Educational Testing Service

The data transcription and editing procedures described in Chapter 6.1 resulted in the generation of disk and tape files containing various assessment information. Before any analysis could begin, these files had to be pulled together into a comprehensive, integrated database. Sampling weights were also required in order to make any valid statistical inferences about the population from which the assessment sample was drawn.

This chapter describes the processes of extraction of sample information for the derivation of sampling weights, and the merging, or bringing together, of the many transcription files into the NAEP database.

6.6.1 EXTRACTION

For each grade/age cohort, four sets of weights were required to perform inferential analyses: school weights, excluded student weights, student weights, and teacher weights. Due to the method by which teachers were selected, sampling weights could not be assigned to teachers, but were instead assigned to students who were linked to participating teachers. (See Chapter 3 for more details.)

All of the sample information was extracted from the data files, edited, and transferred to tape files for shipment to Westat, where the weight computation was performed. The editing process included both the validation of the data values as well as frequency distribution analyses to be compared with tracking information from the data entry system.

The school sample information was available to Westat from the beginning of the assessment. They did not require any additional information from ETS to compute school sample weights.

The excluded student sample information was extracted from the excluded student questionnaire data file. This information included booklet serial number, PSU and school code, grade, sex, birth date, race/ethnicity, and a code indicating reason for exclusion. All data fields were taken from the front cover information of each booklet, except for the exclusion code, which was derived from the response to item 3 of the questionnaire. A listing of the excluded student questionnaires that had not been received at ETS was included with the file for each grade/age cohort.

The student sample information came from two sources: the student database and the absentee file from the administration schedules. The assessed student sample information included booklet serial number, PSU and school code, grade, sex, birth date, race/ethnicity, and teacher code. Since the absent students were not observed and not assigned an assessment booklet, the booklet serial number, race/ethnicity, and teacher code were not available for the absentee data.

The absentee file had to be adjusted for makeup sessions. The field administration procedures required scheduling of makeup sessions if absentee rates exceeded certain limits. The students attending these makeup sessions were supposed to be originally sampled students who were absent for the regular sessions. Failure to remove the makeup students from the absentee file would have resulted in incorrect estimates of the number of students in those schools. This problem could have been particularly acute in the grade 11/age 17 sample where absentee rates were high and many schools required makeup sessions.

The first step in the removal process was to identify the students in the student file who attended makeup sessions in each school. Then, for each school and session type (spiral or tape), the sex, grade, and birth dates of the makeup students were matched with those of the absentee students in the same school and session type. The absentees identified by perfect matches were removed from the absentee file; the remaining unmatched makeup students, if any, were paired with randomly selected absentees who were then removed from the file. This latter procedure was necessary only for the grade 11/age 17 sample in only a few of the many schools that had makeup sessions.

The teacher sample information was extracted from the teacher questionnaire data file. It consisted of only the PSU, school, and teacher codes from the questionnaire booklet covers. Westat used this information in conjunction with the student sample information to produce a file of student-based teacher weights.

6.6.2 FILE MERGING

The transcription process resulted in the generation of five data files for each grade/age cohort: one file for each of the three questionnaire instruments, the student response data file from the data entry system, and the student reading and writing scores from professional scoring and key entry. The sample weight derivation process produced an additional four files of sampling weights. To perform data analysis, these files had to be integrated into a coherent and comprehensive database.

This database would ultimately consist of four files per cohort: school, teacher, excluded student, and student files. The student file would contain all six student samples: the spiral and five bridge samples. The school file could be linked to the other three files through the PSU and school codes. The teacher file could be linked to the student spiral sample through the PSU, school and teacher codes.

The school file was created by merging the school questionnaire file with the computer coordinator questionnaire and then with the school weights file. The PSU and school code were used as the matching criterion. Each record of the resulting file was formed by concatenating the weight information with the response data. Since not all schools returned their questionnaires, some of the output records contained only weight information.

The teacher file was generated from the teacher questionnaire file. Since the teacher weights were derived at the student level, no information had to be added to the questionnaire data.

The excluded student file was the result of merging the excluded student questionnaire file with the excluded student weights file. The booklet serial number was used as the matching criterion.

The creation of the student data file was a three-stage process, merging the student weights, teacher-based student weights,and professionally scored computer items with the student response data, in that order. In all three procedures, the booklet serial number was used as the matching criterion. The merging of the professionally scored item data was a more complex procedure than the others, because the set of scores for each item within a booklet were inserted into the response data fields in the order in which the items appeared in the booklet.

The database was then ready for analysis. As new data values and scores were derived, they were added to the relevant files using the same matching procedures as described above. The public-use data tapes files were ultimately generated from this database.

6.6.3 MASTER CATALOG

A critical part of any database is the processing control and descriptive information. A central repository of this information may be accessed by all analysis and reporting programs to provide correct parameters for processing the data fields as well as consistent identification labeling of the analysis results. The master catalog file was designed and constructed to serve both of these purposes.

Each record of the master catalog contains the processing, labeling, classification, and location information for each data field in the database. The control parameters are used by the access routines in the analysis programs to define the manner in which the raw data values are to be transformed and processed.

All data fields have a 50-character label in the catalog describing the contents of the field and, where applicable, the source of the field. The data fields with discrete or categorical values have additional label fields in the catalog containing the permitted values and 8- and 20- character labels for those values.

The classification area of the catalog record contains distinct fields corresponding to predefined classification categories for the data fields. For a given classification field, a nonblank value indicates the code within that classification category for the data field. This permits the collection of identically classified items or data fields by performing a selection process on one or more classification fields in the catalog.

According to the NAEP design, it is possible for item data fields to occur in more than one age assessment and more than one block within each age. The location fields of the catalog record contain the age, block and, where applicable, the item sequence number within block of each occurrence of the data field throughout the 1986 database.

The master catalog file was constructed in parallel with the collection and transcription of the assessment data to be ready for use by analysis programs when the database was created. As new data fields were derived and added to the database, their descriptive and control information was entered into the catalog.

One of the most important uses of the master catalog was the control of the creation of the public-use data tapes files as well as the codebooks and file layouts. A synopsis of this process is presented in the next chapter.

CHAPTER 6.7

Public-use Data Tape Construction

Chapter 6.7

PUBLIC-USE DATA TAPE CONSTRUCTION

Alfred M. Rogers

Educational Testing Service

The public-use data tapes are designed to permit any researcher or research organization with an interest in the National Assessment to perform secondary analysis on the same data as that used at ETS. This section discusses some of the issues raised during the creation of the data, and summarizes the procedures followed in generating the data and related materials.

The three elements of the distribution package are the data tapes, printed documentation, and microfiche of the assessment instruments. Each grade/age cohort is represented on a separate tape, with each tape containing the data files; a set of SPSS-X control statement files for generating an SPSS-X system file for each data file; a set of SAS control statement files for generating a SAS system file for each data file; and a set of machine-readable catalog files containing control and descriptive information for each data file, for the non-SPSS-X and non-SAS user. The printed documentation consists of four volumes: a guide to the use of the data files, and a set of file layouts and codebooks for the data files within each of the three cohorts (see The NAEP 1985-86 Public-Use Data Tapes Version 2.0 Users' Guide [Rogers, Kline, Norris, Johnson, Mislevy, Zwick, Barone, & Kaplan, 1988]).

6.7.1 FILE DEFINITION

The organization and format of the data files to be produced was the first issue to be addressed. The ETS database consisted of four data files for each grade/age cohort, corresponding to the three questionnaire instruments and the student database, incorporating the spiral and all five bridge samples. The logical relationship of the data files was a three-level hierarchy, with the six student and the excluded student samples at the bottom level; the teacher sample at the next level, with a linkage only to the spiral sample; and the school sample at the top, with direct linkages to all samples below it. A linkage may be viewed as a one-to-many mapping of the records within the two files linked. For example, one school record is linked to one or more records in the teacher file, and each of these teacher records are in turn linked to one or more records in the spiral student file.

One organization scheme has seven files corresponding to the seven samples at the bottom level, with the data from the higher-order samples appended to and repeated across as many of the lower-level records as required by the linkages. Using the previous example, each spiral sample record would be appended by its corresponding teacher record and school record. This approach places no demand on the user to define the linkages since each data record is complete, but it requires substantially more computer storage space due to the larger record size.

An alternative scheme would have these same seven samples without the appended teacher and school data. The teacher and school samples would reside in their own files, with special data fields in all files to facilitate their linkage through program control. At the expense of a little more sophistication on the part of the user, this approach is more economical in computer resource utilization. This potential for savings on computer storage and processing costs was the overriding consideration in choosing this scheme.

6.7.2 VARIABLE DEFINITION

The selection and arrangement of variables, or data fields, in each file was the next order of business. The first step in the decision process was the generation of a file of variable descriptors for each data file to be created. Each of these LABELS files contained one record for each variable, each record containing the variable name, a short text description of the variable, and processing control information to be used by later steps in the public-use data tapes process. This file could be edited for deletion of variables, modification of control parameters, or reordering of the variables within the file.

The first program in the processing stream, GENLYT, produced a printed layout for each file from the information in its corresponding LABELS file. These layouts were initially reviewed for the selection and ordering of the variables. The variables that were excluded from public-use data tape processing fell primarily into two categories: nonapplicable and confidential.

The nonapplicable variables were found mostly in the student database. Since the bridge samples were combined with the spiral sample, many of the variables that applied to the spiral students did not apply to the bridge students, and vice versa. For example, the teacher code and the student-based teacher weights were used for the analysis of spiral sample data, but were not in the design at all for the bridge sample.

The confidential variables included any descriptor or code that could be used to identify individual states, schools, or students in the NAEP sample. The PSU, school, teacher, and student identification codes used internally by ETS and WESTAT were "scrambled" according to specific algorithms to obtain new codes for use in linking the files together.

Another confidentiality problem arose in the response data, where the students were asked to identify the state they had lived in four years ago. A new variable was created using the response code and current state residency information from the PSU code to indicate if the student had lived in the same state, the same region, or a different region.

The ordering of the variables within the data files followed a general trend of decreasing likelihood of usage: Identification information preceded weights, scores, and other derived variables, which were followed by the response data. The identification variables were generally those on the front covers of the instruments. The derived variables included the sampling weights, IRT scale values, and variables derived from the response data or other sources for reporting purposes. The response data variables were arranged according to their order in the instrument.

The spiral sample posed an additional problem because it entailed the expression of as many as 91 different booklet formats into a single, fixed format. The solution lay in arranging the data "blocks" in order within subject areas. The common background questionnaire preceded the first spiral block in the new record. Each data record from the input student base was reformatted according to its booklet number; the data for its constituent blocks were moved into their assigned locations in the output record. The remaining data block areas contained blank fields, indicating that the data was missing by design.

The spiral design also created a problem from the user's standpoint: how to determine, from a given booklet record, which data blocks were present and their relative order in the instrument. This problem was remedied by the creation of a set of control variables, one for each block, which indicated not only the presence or absence of the block but its order in the instrument. These control variables were included in the section of derived variables.

6.7.3 DATA DEFINITION

To enable the data files to be processed on any computer system using any procedural or programming language, it was desirable that the data be expressed in numeric format. This was possible, but not without the adoption of certain conventions for re-expressing the data values.

As mentioned in Chapter 6.3, the responses to all multiple-choice items were transcribed and stored in the database using the letter codes printed in the instruments. This scheme afforded the advantage of saving storage space for items with ten or more response options, but at the expense of translating these codes into their numeric equivalents for analysis purposes. The response data fields for most of these items would require a simple alphabetic-to-numeric conversion. However, the data fields items with ten or more response choices would require "expansion" before the conversion, since the numeric value would require two column positions. One of the processing control parameters on the LABELS file indicates whether or not the data field is to be expanded before conversion and output.

The ETS database contained special codes to indicate certain response conditions: no response, "I don't know" response, multiple response, and unresolvable response. The primary trait scores for the reading essay items included additional special codes for ratings of "illegible" and "off-task" by the scorers. A final special code was assigned to the items that, due to printing error, did not appear in some of the booklets at all. These codes had to be re-expressed in numeric format.

A convention used by ECS in the creation of their public-use data tapes was adopted and enhanced in the designation of these codes: The "I don't know" and nonrateable response was always coded as 7; the "no response" code was 8; and the multiple response received a code of 9. The small number of out-of-range and "missing" responses were coded as blank fields, corresponding to the "missing by design" designation.

This coding scheme created conflicts for those items that had seven or more valid responses as well as the "I don't know" response. These items also required expansion to accommodate the valid responses values. The special codes were "extended" to fill the output data field: The "I don't know" and nonrateable code was extended from 7 to 77; the "no response" code from 8 to 88; the multiple response code from 9 to 99.

The numeric variables on the tape files were classified into two categories: continuous and discrete. The continuous variables include the weights, IRT values, identification codes, and item responses where counts or percentages were requested. The discrete variables include those items for which each numeric value corresponds to a response category. This designation also includes those derived variables to which numeric classification categories have been assigned. The open-ended items were treated as a special subset of the discrete variables and were given a separate categorization to facilitate their identification in the documentation.

6.7.4 DATA FILE LAYOUTS

The data file layouts, as mentioned above, were the first user product to be generated in the public-use data tapes process. The generation program, GENLYT, used a LABELS file as input and produced a printable file. This LAYOUT file is little more than a formatted listing of the LABELS file.

Each line of the LAYOUT file contains the following information for a single data field: sequence number, field name, output column position, field width, number of decimal places, data type, value range, key or correct response value, and a short description of the field. The sequence number of each field is implied from its order on the LABELS file. The field name is an 8-character label for the field that is to be used consistently by all public-use data tapes materials to refer to that field on that file. The output column position is the relative location of the beginning of that field on each record for that file, using bytes or characters as the unit of measure. The field width indicates the number of columns used in representing the data values for a field. If the field contains continuous numeric data, the number of decimal places value indicates how many places to shift the decimal point before processing data values.

The data type category uses three codes to designate the nature of the data in the field: Continuous numeric data are coded "C"; discrete numeric data are coded "D"; open-ended item data are coded "O". Additionally, the discrete numeric fields that include "I don't know" response codes are coded "DI" and the open-ended items that include nonrateable response codes are coded "OI". If the field type is discrete numeric, the value range is listed as the minimum and maximum permitted values separated by a hyphen to indicate range. If the field is a scorable item response, the correct response value, or key, is printed. A range of correct responses was indicated for those professionally scored items that received cut-point scoring for IRT scaling. Finally, each variable was further identified by a 50-character descriptor.

6.7.5 DATA FILE CATALOGS

The LABELS file contains sufficient descriptive information for generating a brief layout of the data file. However, to generate a complete codebook document, substantially more information about the data is required. This function is filled, in part, by the CATALOG file.

The CATALOG file is created by the CATGEN program from the LABELS file and the 1986 master catalog file. Each record on the LABELS file generates a CATALOG record by first retrieving the master catalog record corresponding to the field name. The master catalog record contains usage, classification, and response code information. This record is prefixed by the positional information from the LABELS file: field sequence number, output column position, and field width.

The response code information, also referred to as "foils", consists of the possible data values for the discrete numeric fields, and a 20-character description of each. The CATGEN program uses additional control information from the LABELS file to determine if extra foils should be generated and saved with each CATALOG record. The first flag controls generation of the "I don't know" or nonrateable foil; the second flag regulates "no response" foil generation; and the third flag denotes the possibility of multiple responses for that field and sets up an appropriate foil. All of these control parameters, including the expansion flag, may be altered in the LABELS file by use of a text editor to suit the data behavior for any given field.

The LABELS file supplies control information for many of the subsequent public-use data tapes processing steps. The CATALOG file provides the detail information for those same steps and for others as well.

6.7.6 CODEBOOKS

The data file codebook is designed as a printed document containing complete descriptive information for each data field. Most of this information derives from the CATALOG file; the remaining data came from two other files: the COUNTS file and the IRT parameters file.

Each data field receives at least one line of descriptive information in the codebook. If the data type is continuous numeric, no more detail is given. If the variable is discrete numeric, the codebook lists the foil codes, foil labels, and frequencies of each value in the data file. Additionally, if the field represents an item used in IRT scaling, the codebook lists the parameters used by the scaling program.

The frequency counts are not available on the catalog file, but must be generated from the data itself. The GENFREQ program created the COUNTS file using the field name to locate the variable in the database, and the foil values to validate the range of data values for each field. This program also serves as a check on the completeness of the foils in the CATALOG file, as it flags any data values not represented by a foil value and label.

The IRT parameter file is linked to the CATALOG file through the field name. Printing of the IRT parameters is governed by a control flag in the classification section of the CATALOG record.

The LAYOUT and CODEBOOK files are written by their respective generation programs to print-image disk data files. Draft copies are printed and distributed for review before the production copy is generated. The production copy is printed on an IBM 3800 printing subsystem using laser-imaging technology. The printing is performed at 15 characters per horizontal inch (pitch) and 8 lines per vertical inch. This accommodates printing of 120 characters per line and 80 lines per page on standard 8 1/2" x 11" paper.

6.7.7 SAS AND SPSS-X CONTROL FILES

The SAS and SPSS-X control statement files are provided to the user as a means for converting the raw data files directly into a system file for subsequent analyses under either package. The files are very similar in their content and structure, although actual implementation of their features differ slightly. Two separate programs, GENSAS and GENSPX, generate the control files using the CATALOG file as input.

Each of the control files contain separate sections for variable definition, variable labeling, missing value declaration, value labeling, and creation of scored variables from the cognitive items. The variable definition section describes the locations of the fields, by name, in the file, and, if applicable, the number of decimal places or type of data. The variable label identifies each field with a 50-character description. The missing value section declares which values of which variables are to be treated as missing and excluded from analyses. The value labels correspond to the foils in the CATALOG file. The code values and their descriptors are listed for each discrete numeric variable. The scoring section is provided to permit the user to generate item score variables in addition to the item response variables.

Each of the code generation programs combine three steps into one complex procedure. As each CATALOG file record is read, it is broken into several component records according to the information to be used in each of the resultant sections. These record fragments are tagged with the field sequence number and a section sequence code. They are then sorted by section code and sequence number. Finally, the reorganized information is output in a structured format dictated by the syntax of the processing language.

The generation of the system files accomplishes the testing of these control statement files. These files are saved for use by internal ETS users of the NAEP data.

6.7.8 MACHINE-READABLE CATALOG FILES

For those NAEP data users who have neither SAS nor SPSS-X, yet require processing control information in a computer-readable format, the distribution tape also contains machine-readable catalog (CAT) files.
In addition to processing control information, each CAT record contains the IRT parameters and the foil codes and labels.

PART II

CHAPTER 7

Overview of Part II:
The Analysis of the 1986 NAEP

Chapter 7

OVERVIEW OF PART II: THE ANALYSIS OF 1986 NAEP

Albert E. Beaton

Educational Testing Service

This chapter introduces the second part of this technical report by presenting an overview of the procedures used in analyzing the 1986 NAEP data. The details of the analytic procedures are contained in the chapters that follow. The results of these analyses are presented in many substantive reports which have been published or are in preparation.

Part II of the technical report assumes the existence of a carefully edited database. The reader should consult Chapter 1 of this report for general information about the design of the 1986 assessment and for an overview of the processes that went into the construction of the NAEP database, including the development of objectives and items, the sampling design, the measuring instruments, field administration, professional scoring, data processing, and quality control. Detailed information about these topics is given in the remaining chapters of Part I.

Many of the analytical procedures used in the 1986 NAEP are the same or similar to those used in the 1984 assessment, and their details were reported in Implementing the New Design: The NAEP 1983-84 Technical Report (Beaton, 1987a). We will not repeat general expository information here, but refer to that report instead. In the following chapters describing subject area data analyses, emphasis will be placed on how the techniques were applied.

The 1986 data analysis has introduced some innovations in scaling, which were first introduced to NAEP in the 1984 reading and writing assessments. The purpose of scaling, as used in NAEP, is to communicate to educational policymakers and the concerned public what students in American schools know and can do. Using scaling and statistical estimation techniques, the vast amount of data collected in each assessed subject area can be reduced to a few, informative summary estimates of student performance.

The scaling process permits us to take advantage of certain patterns of responses in the data in order to reduce the information about a student in the sample from his or her responses to many individual items to one or a few summary numbers that represent his or her performance in a subject area. Under certain assumptions, the scaling process allows us to project the performance of different students onto the same scale although, in NAEP, different students may have been asked to respond to different sets of items. Since students who were measured using different sets of items will be measured with different precision, we have developed the plausible values technology to make consistent population estimates and appropriate estimates of their sampling errors.

Since the scaling process, as used in NAEP, is used for data reduction, a question arises as to how far the reduction should go. Scaling uses some, not all, of the available information, and the more the data are reduced, the more the detailed information in the full database is unused and unreported. In analyzing the 1984 assessment data, the decision was made to reduce the reading data to one scale to represent a generalized reading proficiency. The studies of dimensionality that supported this decision are described by Zwick (1987). Reducing the data to one overall scale does not seem adequate for reporting results in the areas of mathematics and science.

A major technical innovation, which was introduced in the analysis of the 1986 NAEP data, was multivariable scaling. In analyzing the 1986 data, we decided to perform less data reduction in mathematics and science by developing and reporting several subscales. The subscales were determined after reviewing the objectives for the subject areas and the number of items assessing those objectives. For mathematics, the subscales were:

- Measurement
- Numbers and operations: Higher-level
- Numbers and operations: Knowledge and skills
- Geometry
- Relations and functions

The first three subscales span all three grade/age levels. Since the last two subareas were not assessed at all grade/age levels, the geometry subscale spans only grade 7/age 13 and grade 11/age 17 and the relations and functions is available for grade 11/age 17 only.

For science, the following subscales were defined:

- Life science
- Chemistry
- Nature of science
- Physics
- Earth and space science
- Physical science

The life science and nature of science subscales span all three grade/age levels. Since a sufficient number of items was not administered for definition of all subscales at all age/grade levels, the chemistry, physics, and earth and space science subscales span grade 7/age 13 and grade 11/age 17 only. The physical science subscale is defined for grade 3/age 9 only.

Although some persons may prefer and make use of the more detailed information available in the mathematics and science subscales, we did not wish to forgo a single overall measure of performance in each subject area. We have assumed that other readers, particularly educational policymakers at the national level as well as the concerned public, would prefer and make use of a general measure of overall proficiency in mathematics or science, although it is possible that such an overall scale might mask gains in some subscales that are balanced by losses in others. We therefore also developed composites of the subscales to represent overall proficiency in mathematics and science. The reader or the user of the public-use data tapes may, therefore, focus on either the overall scales, the subscales, or both.

The overall estimate of a student's proficiency in mathematics or science is a weighted average of his or her proficiency estimates for the several subscales in the area. The weights used in forming the overall estimate was derived from the importance that the Learning Area Committee in the subject area placed on that objective.

The 1984 reading assessment introduced scale anchoring as a way of communicating to educational policymakers what students in American schools know and can do. We wished to anchor the mathematics and science scales as well, but did not feel that enough items were available to anchor at the subscale level, and so decided to anchor only the overall scales. Since the overall scales were not derived directly from item response theoretic methods, the method used in 1984 and described by Beaton (1987b), which uses IRT item parameters, was not directly applicable. Thus, a different way of scale anchoring had to be used.

As mentioned in Implementing the New Design, scale anchoring is not dependent on the parameters of a model such as the three-parameter logistic model, which is used in item response theory. The basic idea of scale anchoring is locating items that discriminate between selected points on a scale, and then analyzing those items to describe what it is that students at a higher level can do that students at a lower level cannot. The location of discriminating items was done directly, that is, by computing the proportion of students at or near each anchor point on the overall scale who responded correctly to an item and then comparing that proportion with the proportion of students at the next lower anchor point who correctly responded. Items with large increases in proportion correct at particular scale points were referred to subject matter experts for interpretation. Both the overall mathematics and science composites were anchored in this way.

A substantial part of the 1986 NAEP data analysis involved the reading anomaly. The 1986 NAEP trend data indicated a substantial drop in the average reading proficiency of students at the 9- and 17-year-old levels and increases in variance at all three age levels. The changes were so substantial as to be deemed anomalous, and a major effort was made to explain what happened. The NAEP staff examined a number of hypotheses about what might have caused such anomalous results, including changes in the student population, modifications of the NAEP design and administrative procedures, lapses in quality control, computer bugs, as well as external uncontrollable events. Although the results of some of its investigations are inconclusive, some hypotheses, such as inaccuracies in sampling, scaling, and quality control, can be ruled out beyond a reasonable doubt. The design of the 1988 NAEP was modified to explore the reading anomaly further. The study of the reading anomaly is presented in another report The NAEP 1985-86 Reading Anomaly: A Technical Report (Beaton, 1988).

The remaining chapters in this part of the report are as follows:

Chapter 8 is a general discussion of the scaling procedures used in NAEP, including the multivariable scaling procedures used for mathematics and science and the WARM method that was used for background and attitude questions. This chapter also discusses the procedures that created the plausible values and suggestion about how these values can be used for consistent estimates of population parameters and their standard errors. Sources of bias in secondary analyses are also discussed. Finally, this chapter presents an overview of the 1986 NAEP scales and the conditioning variables used in their creation.

Chapter 9 presents the details of the analysis procedures used with the 1986 reading data. The reading data were scaled using the same scaling method that was used in 1984, which produced a single overall reading scale. However, the trend results were deemed anomalous, and have not been reported to the public. Cross-sectional analyses were performed and reported in Who Reads Best? Factors Related to Reading Achievement in Grades 3, 7, and 11 (Applebee, Langer, & Mullis, 1988).

Chapter 10 presents the details of the analysis of the mathematics data. For developing trend information, the 1986 design included subsamples in which mathematics was assessed in the same way as in the 1972-73, 1977-78, and 1981-82 assessments, the only years in which mathematics was assessed in the past. The number of items common to all assessments in the different years was small, and so a single overall mathematics scale was developed for trend reporting. The main NAEP sample in the 1986 assessment had a sufficient number of mathematics items for multivariable scaling, and so proficiencies on several subscales were estimated, and the estimates were used for cross-sectional analyses. The results of the mathematics assessment, both trend and cross-sectional, are presented in The Mathematics Report Card: Are We Measuring Up? Trends and Achievement Based on the 1986 National Assessment (Dossey, Mullis, Lindquist, & Chambers, 1988).

Chapter 11 presents the details of the science data analyses. The general form of the science analyses was the same as mathematics, since this was also the first time science was scaled. Science was assessed in the past in 1971-72, 1977-78, and 1981-82. The results of the science analyses will be published in August, 1988.

Chapter 12 presents the methodology used in the computer competence assessment. The 1986 assessment was the first to include computer competence and thus there was no trend information to report. Since the types of information was varied and its structure unexplored, no scaling was attempted in this area. The statistical methodology was limited to the average percentage correct method that was used in past assessments. The computer competence results are presented in Computer Competence: The First National Assessment (Martinez & Mead, 1988).

Chapter 13 describes the analytic procedures used in the analysis of the U.S. history and literature assessments. U.S. history and literature were assessed at grade 11/age 17 only. Neither subject area had comparable data available from past assessments, and so no trend analysis was possible. The dimensionality of the two subject areas was studied, and one overall scale for each area was decided upon. The results of the scaling and analysis have been published in the NAEP report Literature & U.S. History: The Instructional Experience and Factual Knowledge of High School Juniors (Applebee, Langer, & Mullis, 1987).

Chapter 14 presents the analytical procedures used in developing the sampling weights, including various nonresponse adjustments, trimming, and poststratification. This chapter also details the jackknife procedure used to make estimates of sampling variance in the NAEP analyses. The final section shows estimates of the design effects for 1986 NAEP.

CHAPTER 8

Scaling Procedures

Chapter 8

SCALING PROCEDURES[1]

Robert J. Mislevy

Educational Testing Service

8.1 INTRODUCTION

A key innovation in NAEP during the ETS tenure is scale-score reporting. With scale-score methods, the performance of a sample of students in a subject area or subarea can be summarized on a single scale even if different students have been administered different exercises. Similar procedures can be used to summarize responses to sets of related background questions. This chapter presents an overview of the scaling methodologies employed in the analyses of the 1986 NAEP surveys:

- Section 8.2 briefly discusses the perspective on scaling from which the procedures were conceived and applied.
- Section 8.3 reviews the "plausible values" methodology used in NAEP scale-score analyses.
- Section 8.4 describes how plausible values are used in subsequent analyses.
- Section 8.5 lists the scale-score analyses carried out on the 1986 data.

Details of scaling procedures for specific subject areas are presented in Chapters 9, 10, 11, and 13.

8.2 SCALING IN NAEP

As it was originally conceived some twenty years ago, NAEP was intended to limit reports to percents-correct on individual items. It soon became apparent, however, that some level of aggregation was needed to communicate results effectively. Average percents-correct over sets of items, as introduced by the Education Commission of the States, improved reporting by providing such an aggregation. Their limitation to specific and unchangeable sets of items hampered the refinement of the item pool over time, however, and provided no information about the distributions of skills among students in targeted populations.

---

[1] The contributions of Albert Beaton, Douglas Gentile, Eugene Johnson, Kathleen Sheehan, Minhwei Wang, and Rebecca Zwick to this chapter are gratefully acknowledged.

These limitations can be overcome by the use of response scaling methods. If several items require similar skills, the regularities observed in response patterns can often be exploited to characterize both respondents and items in terms of a relatively small number of variables. When combined through appropriate mathematical formulas, these variables capture the dominant features of the data. Using the scale, it becomes possible to talk about distributions of proficiency in a population or subpopulation, and to estimate the relationships between proficiency and background variables.

Early work on scaling is attributed to Thurstone, but the more recent development of item response theory (IRT; e.g., Lord, 1980) has been particularly influential on measurement practice. IRT and a newly developed procedure called the weighted average response method (WARM), both of which are reviewed in section 8.3, are the two scaling procedures ETS has introduced in NAEP reporting.

We hasten to point out that any procedure of aggregation, from a simple average to a complex multidimensional scaling model, highlights certain patterns by collapsing over others. In a very real sense, every single item in a NAEP survey is of interest in its own right, and may provide useful information about what young Americans know and can do. The choice of an aggregation procedure must be driven by a conception of just which patterns are salient for a particular purpose. The procedure that is optimal for one purpose may be poorly suited for another.

The relatively high levels of aggregation found in ETS/NAEP reports such as The Reading Report Card: Progress Toward Excellence in Our Schools (1985), for example, are well suited to high-level discussions of trends and policy implications. They average over, and therefore are not keyed to, the microanalysis of performance at the level of specific skills, as might be desired by educational psychologists; they do not reveal popular student misconceptions or erroneous rules, as might be of interest to classroom teachers in a subject area. For the first of these latter purposes, one might prefer the precision of a latent class model for more highly specified skills. For the second, detailed discussions of results for individual items might be more appropriate. By no means do the scale-score methods we employ as a reporting vehicle exhaust the potential of NAEP data; neither do they preclude other researchers from carrying out alternative analyses from different perspectives.

A reporting scale in the 1986 NAEP survey simply provides a summary of performance on a collection of items. To be useful in the context of educational assessment, such collections must be defined in terms of (1) the psychology of school learning (Messick, 1984), since this reflects how pupils learn, and (2) the organization of schools, since this is the channel through which educational policy flows. The following paragraphs outline the perspective on scale delineation employed in the 1986 assessment, as based on the experiences of not only NAEP itself, but of the California Assessment Program (CAP) and the assessments of Britain's National Foundation for Educational Research (NFER).

CAP and NFER offer two early experiences concerning the breadth of scaling, both occurring during the mid- to late seventies. NFER employed a collection of broadly defined scales in conjunction with an IRT model that made strong assumptions about item reliabilities and the character of change. Unfortunately, this approach led to measures whose meanings could not always be maintained over time or from one subpopulation to another (Goldstein, 1980). Partly in response to these problems, CAP took an opposite tack, delineating large numbers of narrowly defined scales within each subject area at each assessment grade level. Third-grade reading, for example, comprises seventeen "indivisible skill elements," each conceived so that changes in curricular emphasis have similar impact on all its items (Bock & Mislevy, 1981). The adequacy of this approach has been borne out empirically by the stability of item parameter estimates over time (Mislevy & Bock, 1982).

The specificity of the CAP scales offers the possibility of detecting the effects of small shifts in curricular emphases, an important concern for an assessment whose primary focus is the school. The CAP scales prove more specific than necessary for tracking more broadly conceived trends in performance. After correction for measurement error, CAP school-level correlation matrices among elements exhibit blocks of entries that are essentially unity. Parallel patterns of trends within such blocks of elements also indicate that the integrity of scales within reading, for instance, would be maintained if they were defined at the level of "inferential comprehension" rather than of five subcategorizations within inferential comprehension.

The evidence on scaling for educational assessment, then, suggests that one scale for a subject area is probably too few, but twenty is probably too many. ETS/NAEP scaling procedures for mathematics and science reflect this view. Five scales in mathematics and six in science, along with a composite in each area, have been designed to capture the essential subdivisions of the subject areas as indicated by NAEP's learning area committees. We initially fit models to data along these lines, and modified the final analyses when unacceptable model violations resulted (see chapters on specific subject areas).

Scaling within subareas does not ignore the desire of policymakers and the public at large for a single index of performance in a subject area--one of the objectives of an educational assessment discussed by Bock and Mislevy (1988) in their introduction of the "duplex design." A summary is easily obtained as the (possibly weighted) average of results across subscales. The resulting composite scores are useful to policymakers as quick summaries of overall performance, and to secondary researchers interested in the relationships between performance and student background variables. Compared to fitting a single scale to a broadly defined subject area, though, the approach of first scaling within narrowly defined subareas more closely satisfies the assumptions of scaling models and maintains the capability to characterize important interactions or countertrends within educationally relevant subdivisions of the subject area as a whole.

8.3 NAEP SCALING METHODOLOGY

The paragraphs that follow review the scaling models employed in the analyses of 1986 NAEP data, and the "plausible values" methodology that allows such models to be used with NAEP's sparse item-sampling design. The reader is referred to Mislevy (1988) for an introduction to plausible values methods and a comparison with standard psychometric analyses, to Mislevy and Sheehan (1987) and Beaton and Johnson (1987) for additional information on how the models are used in NAEP, and to Rubin (1987) for the theoretical underpinnings of the approach.

8.3.1 The Scaling Models

Two types of scaling models were used by NAEP in the 1986 assessment. For the subject areas, the 3-parameter logistic (3PL) model from item response theory (IRT; e.g., Lord, 1980) was used. For selected sets of background questions, the weighted average response method (WARM; Beaton & Johnson, 1987), developed by NAEP for the 1984 assessment, was used. Both are "latent variable" models, quantifying respondents' tendencies to provide responses in a given direction (e.g., correct answers to items in a subject area; positive responses on attitude questions), as a function of a parameter that is not directly observed.

The 3-parameter logistic (3PL) IRT model. The fundamental equation of the 3PL is the probability that a person whose proficiency is characterized by the unobservable variable θ will respond correctly to item j:

$$\begin{aligned} P(x_j=1|\theta,a_j,b_j,c_j) &= c_j + (1-c_j)/\{1+\exp[-1.7a_j(\theta-b_j)]\} \\ &= P_j(\theta) \quad , \qquad (8.1) \end{aligned}$$

where

x_j is the response to item j, 1 if correct and 0 if not;

a_j, where $a_j>0$, is the slope parameter of item j, characterizing its sensitivity to proficiency;

b_j is the threshold parameter of item j, characterizing its difficulty; and

c_j, where $0 \leq c_j < 1$, is the lower asymptote parameter of item j, reflecting the chances of a correct response from students of very low proficiency. In 1986 NAEP analyses, c parameters were estimated for multiple-choice items, but were fixed at zero for open-ended items.

For the purposes of reporting item parameter estimates and other intermediary estimates, the linear indeterminacy apparent in (8.1) may be resolved by an arbitrary choice of the origin and unit size in a given scale. This was done for the reading scale in 1984 by standardizing the combined grade 4/age 9, grade 8/age 13, and grade 11/age 17 samples. To aid interpretation, final published results are reported on scales that are transformed linearly from the θ scale in ways related to the 0-to-500 reading proficiency (RP) scale developed in the 1984 NAEP assessment of reading (Beaton, 1987b). These transformations are described in the appropriate subject area chapters in this report.

Under the usual IRT assumption of local independence, the probability of a vector $x=(x_1,\ldots,x_n)$ of responses to n items is simply the product of terms based on (8.1):

$$P(x|\theta,\underline{a},\underline{b},\underline{c}) = \prod_{j}^{n} [P_j(\theta)]^{x_j}[1-P_j(\theta)]^{1-x_j} . \qquad (8.2)$$

After x has been observed, (8.2) can be considered a likelihood function, and provides a basis for inference about θ or about item parameters. In NAEP, estimates of item parameters were obtained with Mislevy and Bock's (1982) BILOG computer program, then treated as known in subsequent calculations. Once items have been calibrated in this manner, a likelihood function for θ is induced by a vector of responses to any subset of calibrated items, thus allowing θ-based inference from matrix samples.

In all NAEP IRT analyses, missing responses at the end of each block a student was presented were considered as not-reached, and treated as if they had not been presented. Missing responses before the last observed response in a block were considered intentional omissions, and treated as fractionally correct at the value of the reciprocal of the number of response alternatives. These conventions are discussed by Mislevy and Wu (1988). With regard to the handling of not-reached items, they find that ignoring not-reached items introduces slight biases into item parameter estimation to the degree that (i) not-reached items are present and (ii) speed is correlated with ability. With regard to omissions, they find that the method described above provides consistent, though limited information, estimates of item and ability likelihoods under the assumption that respondents are acting in accordance with directions to omit only if they can do no better than responding randomly.

The weighted average response method (WARM). The basic equation of the WARM is an average of item responses:

$$\theta = w'x . \qquad (8.3)$$

Here w is a vector of constants, specified so as to provide a meaningful summary of performance. Weights of 1/n for an n-item test, for example, yield simply an average score; weights given by the k^{th} eigenvector of the covariance matrix for x yield the k^{th} component score. If a respondent responded to all items, then a WARM score would be directly calculable via (8.3) without error. Typically, however, a given NAEP respondent receives only a subset of the items in a WARM scale, so that his or her WARM θ is not observed directly.

8.3.2 An Overview of Plausible Values Methodology

Item response theory was developed in context of measuring individual examinees' abilities. In that setting, each individual is administered enough items (often 100 or more) to permit precise estimation of his or her θ, as a maximum likelihood estimate $\hat{\theta}$, for example. Because the uncertainty associated with each θ is negligible, the distribution of θ, or the joint distribution of θ with other variables, can then be approximated using individuals' $\hat{\theta}$ values as if they were θ values.

This approach breaks down in the assessment setting when each respondent is administered fewer items in any single scaled area, in order to provide broader content coverage in limited testing times. (It was in fact attempted by ETS in early, aborted analyses of the 1984 NAEP reading survey; see Beaton, 1987, section 10.2.) The main difficulty is that the uncertainty associated with individual θs is too large too ignore, and the features of the $\hat{\theta}$ distribution can be seriously biased as estimates of the θ distribution. Plausible values were developed as a means of obtaining consistent estimates of at least some population features, and approximations of others no worse than would be obtained using standard IRT procedures. A detailed development of plausible values methodology is given in Mislevy (1988). Along with theoretical justifications, that paper presents comparisons with standard procedures, discussions of biases that arise in some secondary analyses, and numerical examples. The following paragraphs give a brief overview of the approach, focusing on its implementation in the 1986 NAEP analyses.

Let $\underline{y}$ represent the responses of all sampled examinees to background and attitude questions. If IRT or WARM θ values were available for all sampled examinees, it would be possible to compute a statistic $t(\underline{\theta},\underline{y})$--such as a subpopulation sample mean, a sample percentile point, or a sample variance--to estimate a corresponding population quantity T. A function $U(\underline{\theta},\underline{y})$--e.g., a jackknife estimate--would be used to gauge sampling uncertainty.

Because the 3PL and the WARM are latent variable models, however, θ values are not observed even for sampled students. In the U.S. history and literature assessments, where enough responses are solicited from each student to provide a fairly precise estimate $\hat{\theta}$ of his or her θ value, values of $t(\hat{\underline{\theta}},\underline{y})$ and $U(\hat{\underline{\theta}},\underline{y})$ are reported as approximations of corresponding $t(\underline{\theta},\underline{y})$

and $U(\underline{\theta},\underline{y})$ values. In other subject areas, and with WARM background-variable scales, the small numbers of items administered to most sampled students preclude this simple approximation. In these areas, "plausible values" methods were used.

Following Rubin (1987), we can think of $\underline{\theta}$ as "missing data" and approximate $t(\underline{\theta},\underline{y})$ by its expectation given $(\underline{x},\underline{y})$, the data that actually were observed, as follows:

$$\begin{aligned} t^{*}(\underline{x},\underline{y}) &= E[t(\underline{\theta},\underline{y})|\underline{x},\underline{y}] \\ &= \int t(\underline{\theta},\underline{y})\, p(\underline{\theta}|\underline{x},\underline{y})\, d\underline{\theta} \quad . \qquad (8.4) \end{aligned}$$

It is possible to approximate t^{*} using random draws from the conditional distributions $p(\theta|x_i,y_i)$ of each sampled student i. These values are referred to as imputations in the sampling literature, and "plausible values" in NAEP. The value of θ for any respondent that would enter into the computation of t is thus replaced by a randomly selected value from the conditional distribution for θ given his or her responses to cognitive items (x_i) and background items (y_i). Rubin (1987) proposes this process be carried out several times--multiple imputations--so that the uncertainty associated with imputation can be quantified. The average of the results of K estimates of t, each computed from a different set of plausible values, is a Monte Carlo approximation of (8.4); the variance among them, B, reflects uncertainty due to not observing θ, and must be added to the estimated expectation of $U(\underline{\theta},\underline{y})$, which reflects uncertainty due to testing only a sample of students from the population. Section 8.4 explains how these plausible values are used in subsequent analyses.

It cannot be emphasized too strongly that **plausible values are not test scores for individuals** in the usual sense.

Plausible values are offered only as intermediary computations for calculating integrals of the form of Equation 8.4 in order to estimate population characteristics. When the underlying model is correctly specified, plausible values will provide consistent estimates of population characteristics, even though they are biased estimates of the proficiencies of the individuals with whom they are associated.

In both IRT and WARM analyses in NAEP, plausible values are included for students who were presented items in a subject area or subarea, but did not respond to any of them. The conditional distribution employed here for such a nonrespondent is based solely on his or her background values y. Nonrespondents were included in this manner, even though they provide no information about their proficiency, in order to maintain the representativeness of the sample. This convention provides estimates of population characteristics that have the same expected value and precision as would be obtained under the more familiar nonresponse adjustment of deleting the nonrespondents and boosting the sampling weights of respondents with the same y values.

8.3.3 Computing Plausible Values in IRT-based Scales

Plausible values for each respondent i are drawn from the conditional distribution $p(\theta|x_i,y_i)$. This subsection describes how, in IRT-based scales, these conditional distributions are characterized and how the draws are taken. Using conditional independence,

$$p(\theta|x_i,y_i) \propto P(x_i|\theta)\ p(\theta|y_i), \qquad (8.5)$$

where $P(x_i|\theta)$ is the likelihood function for θ induced by observing x_i (treating item parameter estimates as known true values) and $p(\theta|y_i)$ is the distribution of θ given the observed value y_i of background responses.

Equations (8.4) and (8.5) can also be employed with vector-valued θ, as in the 1986 NAEP mathematics subscales. In such cases, $P(x_i|\theta)$ is the product over subscales of the independent likelihoods induced by the items within each subscale, and $p(\theta|y_i)$ is the multivariate--and generally non-independent--joint density of proficiencies for the subscales, conditional on background variables y.

In the analyses of 1986 NAEP data, a normal (Gaussian) form was assumed for $p(\theta|y_i)$, with a common dispersion and with a mean given by a main-effects model for selected elements of the complete vector of background variables. The included background variables will be referred to as the conditioning variables, and will be denoted y^c. (The conditioning variables used in 1986 NAEP analyses are given in Table 8.4.) The following model was fit in each subject area:

$$\theta = \Gamma\ y^c + \varepsilon\ , \qquad (8.6)$$

where ε is normally distributed with mean 0 and dispersion Σ. Γ and Σ are the parameters to be estimated. In subject areas with only one scale, such as reading, Γ is a vector and Σ is a scalar. In subject areas comprising subscales, Γ is a matrix and Σ is a covariance matrix. Like item parameter estimates, these estimates of the parameters of conditional distributions were treated as known true values in subsequent steps of the analyses. (Planned developments for future assessments will take this uncertainty into account.)

Maximum likelihood estimates of Γ and Σ were obtained with Sheehan's (1985) M-GROUP computer program, using a variant of the EM solution described in Mislevy (1985). The difference from the published algorithm lies in the numerical approximation that was employed. Note from (8.5) that $p(\theta|x_i,y_i)$ is proportional to the product of two terms, the likelihood $P(x_i|\theta)$ and the conditional distribution $p(\theta|y_i)$. The conditional distribution has been assumed multivariate normal, with mean $\mu_i^c = \Gamma\ y_i^c$ and covariance matrix Σ; if the likelihood is approximated by another normal distribution, with mean μ_i^L and covariance matrix Σ_i^L, then the posterior $p(\theta|x_i,y_i)$ is also multivariate normal with covariance matrix

$$\Sigma_i^P = (\Sigma^{-1} + (\Sigma_i^L)^{-1})^{-1} \qquad (8.7)$$

and mean vector

$$\tilde{\theta}_i = (\theta_i^c \Sigma^{-1} + \theta_i^L \Sigma_i^{L\,-1})(\Sigma_i^P)^{-1} \quad . \qquad (8.8)$$

In the 1986 analyses, a normal approximation for $P(x_i|\theta)$ is accomplished in a given scale by the steps described below. (Recall that by the assumed conditional independence across scales, the joint conditional likelihood for multiple scales is the product of independent likelihoods for each of the scales.) These computations are carried out in the scale determined by BILOG (Mislevy & Bock, 1982) item parameter estimates, where the mean and standard deviation of the composite population formed by combining the three NAEP grade/ages has mean zero and standard deviation one.

1. Lay out a grid of Q equally spaced points from -5 to +5, a range that covers the region in each scale where all examinees from all NAEP grade/age groups are virtually certain to occur. The value of Q varies from 20 to 40, depending on the scale being used; smaller values suffice for scales with few items given to each respondent, while larger values are required for scales with many items.

2. At each point X_q, compute the likelihood $L(x_i|\theta=X_q)$.

3. To improve the normal approximation in those cases in which likelihoods are not roughly symmetric in the range of interest--as when all of a respondent's answers are correct--multiply the values from Step 2 by the mild smoothing function

$$S(X_q) = \frac{\exp(X_q+5)}{[1+\exp(X_q+5)][1+\exp(X_q-5)]} \quad .$$

This is equivalent to augmenting each examinee's response vector with responses to two fictitious items, one extraordinarily easy item that everyone gets right and one extraordinarily difficult item that everyone gets wrong. This expedient improves the normal approximation for examinees with flat or degenerate likelihoods in the range where their conditional distributions lie, but has negligible effects for examinees with even modestly well-determined symmetric likelihoods.

4. Compute the mean and standard deviation of θ using the weights $S(X_q)$ obtained in Step 3.

At this stage, then, the likelihood induced by a respondent's answers to the items in a given scale is approximated by a normal distribution. In an area such as reading where there is only one scale, a single normal distribution thus summarizes information from item responses. In an area such as mathematics or science where there are several scales, independent normal distributions, one per subscale, summarize information from responses to items from the several scales.

This normalized-likelihood/normal posterior approximation was then employed in both the estimation of Γ and Σ and in the generation of plausible values. From the final estimates of Γ and Σ, a respondent's posterior distribution was obtained from the normal approximation using the four-step procedure outlined above. A plausible value was drawn from this normal distribution--univariate normal, in areas like reading with only a single scale; multivariate normal in areas like mathematics and science, with multiple subscales. For those subject areas with multiple subscales, weighted-average composites over subscales were also calculated after appropriate rescaling (see subject area chapters for definitions of composites).

8.3.3.2 Computing Plausible Values in WARM Scales

In 1986 NAEP, the weighted average response method (WARM) was used to create composite variables from related background questions. The creation of the WARM composites proceeded in two steps:

(1) the definition of the composite variables, and

(2) the construction of student-level plausible values for each composite.

The process of developing the composite variables for the background factors relating to achievement in a given subject area was initiated by conducting a factor analysis of the results of the pool of background questions related to that subject area for each of the three grade/age levels separately. As was the case for the cognitive questions, the background questions were included in the BIB spiralled blocks in such a way that no student responded to all of the questions. However, since BIB spiralling has the property that every pair of questions is administered to a randomly equivalent subsample of students, all intercorrelations among the pool of background questions can be consistently estimated from the responses of the students answering each pair of questions. This resulted in nine correlation matrices, one for each combination of grade/age and subject area. Each of these matrices were factored using principal components with unities on the diagonal. The latent roots were examined and a decision of the number of factors to rotate was made. For each of the nine grade/age-by-subject-area cases, the selected number of factors were rotated orthogonally to a varimax solution, the results were examined and questions were assigned to unique factors.

The questions assigned to a factor were then scaled so that the responses to each question were on a 1 to 5 scale and, if necessary, oriented by reversal so that a score of 1 corresponded to the most negative response and a score of 5 to the most positive. Finally, the WARM composite corresponding to the factor was defined as the simple average of these scaled and oriented responses to the questions assigned to that factor.

The final step in the creation of the composite background variables was the creation of sets of student level plausible values for each composite. If a respondent had answered all questions going into the composite, then that respondent's WARM score would be directly calculable, without error, by

$$\theta = w'x$$

where x is the vector of the subject's responses to the n questions in the composite and w is a vector of n constants, each equal to 1/n. However, since each respondent is typically presented only a subset of the questions, a respondent's composite value must be estimated by an application of the WARM technology. Briefly, the WARM technology, which is a kind of multiple regression, produces for each student a set of plausible values, each of which predicts what that student's composite score might plausibly be, based on the student's responses to the questions in the composite that were presented to the student and based on the student's status on the conditioning variables listed in Table 8.4 at the end of this chapter.

Let x^o_i represent the responses of the i^{th} student to the questions in the composite which were presented to that student and let y^c_i be the values of that student's conditioning variables. Then the k^{th} plausible value of the WARM composite θ, based on the student's observed responses and conditioning variables is

$$\hat{\theta}_{ik} = \hat{\Gamma}\, y^c_i + \hat{\beta}\, x^o_i + \gamma_k\, y^c_i + \alpha_k\, x^o_i + \epsilon_{ik}$$

where

$\hat{\theta}_{ik}$ is the k^{th} plausible value of the WARM composite,

$\hat{\Gamma}$ is the vector of estimated effects for the conditioning variables,

$\hat{\beta}$ is the vector estimated as giving the change in the composite variable for a unit change in the scores on each of the questions in x^o_i, with the linear effect of the conditioning variables held fixed,

$[\gamma_k, \alpha_k]$ is a random draw from a $N(0,\Sigma)$ distribution, where Σ is the estimated variance-covariance matrix of the estimates of $\hat{\Gamma}$ and $\hat{\beta}$ and reflects the uncertainty due to using sample estimates of the regression equation; and

ϵ_{ik} is an estimated residual drawn from a $N(0,\sigma^2_\epsilon)$ distribution where σ^2_ϵ is the variance of the predictive distribution of the WARM value given the observed values of y^c_i and x^o_i.

The parameters relating the responses on a given set of background questions ($\hat{\beta}$) and values of the conditioning variables ($\hat{\Gamma}$) with the means of the responses each of the questions in the WARM composite were estimated by least-squares technology. To accomplish this it is sufficient to obtain estimates of the means, variances, and interitem covariances, by conditioning subgroup, for the complete set of background questions going into the composite. Because the WARM composite is the mean of the individual questions, this in turn produces estimates, by conditioning subgroup, of the WARM value mean and variance, as well as of the covariances between the WARM composite and each of the individual background questions. These provide a complete set of sufficient statistics (the normal equations) for the standard least-squares prediction of a WARM composite value given conditioning variable characteristics and responses to any subset of the background questions.

Solving these normal equations produces the standard least-squares point estimate of a student's score on the composite, which is, in the above notation,

$$\tilde{\theta}_i = \hat{\Gamma}\, y^c_i + \hat{\beta}\, x^o_i \ .$$

This standard estimate does not take into account the distribution of potential scores for any individual. In fact, $\tilde{\theta}_i$ is an estimate of the mean of the predictive distribution of potential θs for the individual and, as such, does not address the likelihood of other values from this distribution, any one of which might also have been the student's WARM composite score had the student answered all the questions. (Note: for convenience we are treating the WARM composite as a continuous variable; it is in fact discrete, but can take a large number of closely spaced values.)

A check on the impact of the approximations and simplifying assumptions employed in the WARM approach was carried out with the writing data from the 1984 NAEP writing assessment (Beaton & Johnson, 1987). As a comparison for subgroup average writing scores, the same statistics were calculated using a totally different approach--the model-free, unbiased estimate for average responses based on the methodology employed by the Education Commission of the States in previous NAEP analyses. The latter method is prohibitively expensive to be used for all NAEP statistics, but could be calculated for the 44 questions in the common background questionnaire. Beaton and Johnson found that statistics based on the WARM were nearly indistinguishable from the model-free averages for those subgroups distinguished as conditioning variables, and for subgroups whose memberships were well-predicted by conditioning variables. Estimated standard errors were also smaller for the WARM estimates. For those subgroups that were neither conditioned on nor well-predicted by conditioning variables, the WARM exhibited biases. The nature of such biases in plausible values methodology is discussed further in section 8.4.3 of this report. Their causes, properties, and remedies are discussed at length in Mislevy (1988).

8.4 ANALYSES

When survey variables are observed without error from every respondent, standard variance estimators quantify the uncertainty associated with sample statistics from the only source, namely the sampling of respondents. Item percents-correct for NAEP cognitive exercises meet this requirement, but scale-score proficiency values do not. The IRT and WARM models used in their construction posit an unobservable proficiency variable θ to summarize performance on the items in the area. The fact that θ values are not observed even for the respondents in the sample requires additional statistical machinery to draw inferences about θ distributions and to quantify the uncertainty associated with those inferences. As described above, we have adapted Rubin's (1987) multiple imputations procedures to the context of latent variable models to produce the plausible values upon which many analyses of the 1986 NAEP data are based. This section describes how plausible values were employed in subsequent analyses to yield inferences about population and subpopulation distributions of proficiencies.

8.4.1 Computational Procedures

Even though we do not observe the θ value of respondent i, we do observe variables that are related to it: x_i, the respondent's answers to the cognitive items he or she was administered in the area of interest, and y_i, the respondent's answers to demographic and background variables. Suppose we wish to draw inferences about a number $T(\underline{\theta},\underline{Y})$ that could be calculated explicitly if the θ and y values of each member of the population were known. Suppose further that if θ values were observable, we would be able to estimate T from a sample of N pairs of θ and y values by the statistic $t(\underline{\theta},\underline{y})$ [where $(\underline{\theta},\underline{y}) = (\theta_1,y_1,\ldots,\theta_N,y_N)$], and that we could estimate the variance in t around T due to sampling respondents by the function $U(\underline{\theta},\underline{y})$. Given that observations consist of (x_i,y_i) rather than (θ_i,y_i), we can approximate t by its expected value conditional on $(\underline{x},\underline{y})$, or

$$t^*(\underline{x},\underline{y}) = E[t(\underline{\theta},\underline{y})|\underline{x},\underline{y}]$$

$$= \int t(\underline{\theta},\underline{y})\, p(\underline{\theta}|\underline{x},\underline{y})\, d\underline{\theta} .$$

It is possible to approximate t^* with random draws from the conditional distributions $p(\theta_i|x_i,y_i)$, which are obtained for all respondents by the method described above in section 8.2. Let $\hat{\underline{\theta}}_m$ be the m^{th} such vector of "plausible values," consisting of a (possibly multidimensional) value for the latent variable of each respondent. This vector is a plausible representation of what the true $\underline{\theta}$ vector might have been, had we been able to observe it. The following steps describe how an estimate of a scalar statistic $t(\underline{\theta},\underline{y})$ and its sampling variance can be obtained from M (>1) such sets of plausible values. (Note: Five sets of plausible values were used in NAEP analyses in each subject area, and are provided on the NAEP public-use data tapes for secondary analysis.)

1. Using each set of plausible values $\hat{\underline{\theta}}_m$ in turn, evaluate t as if the plausible values were true values of $\underline{\theta}$. Denote the results $\hat{t}_m$, for m=1,...,M.

2. Using the multiple weight jackknife approach (see section 14.2.1), compute the estimated sampling variance of $\hat{t}_m$, denoting the result U_m.

3. The final estimate of t is

$$t^* = \sum_{m=1}^{M} \hat{t}_m / M \quad .$$

4. Compute the average sampling variance over the M sets of plausible values, to approximate uncertainty due to sampling respondents:

$$U^* = \sum_{m=1}^{M} U_m / M \quad .$$

5. Compute the variance among the M estimates $\hat{t}_m$, to approximate uncertainty due to not observing θ values from respondents:

$$B_M = \sum_{m=1}^{M} (\hat{t}_m - t^*)^2 / (M-1) \quad .$$

6. The final estimate of the variance of t^* is the sum of two components:

$$V = U^* + (1+M^{-1})\, B_M \quad .$$

Note: Due to the excessive computation that would be required, NAEP analyses did not compute and average jackknife variances over all five sets of plausible values, but only on the first set. Thus, in NAEP reports, U^* is approximated by U_1.

8.4.2 Statistical Tests

Suppose that if θ values were observed for sampled students, the statistic $(t - T)/U^{1/2}$ would follow a t-distribution with d degrees of freedom. Then the incomplete-data statistic $(t^* - T)/V^{1/2}$ is approximately t-distributed, with degrees of freedom given by

$$\nu = \frac{d}{d + r_M^{-2}(M-1)} (M-1)\,(1+r_M^{-1})^2 = d\,\frac{(1+r_M)^2}{1 + (d\,r_M^2/(M-1))} ,$$

where r_M is the relative increase in variance due to not observing θ values:

$$r_M = (1+M^{-1})\,B_M/\,U^* .$$

When B_M is small relative to U^*, the reference distribution for incomplete-data statistics differs little from the reference distribution for the corresponding complete-data statistics. This is the case with main NAEP reporting variables. If in addition d is large, the normal approximation can be used to flag "significant" results.

For k-dimensional $\underset{\sim}{t}$, such as the k coefficients in a multiple regression analysis, each U_m and U^* is a covariance matrix, and B_M is an average of squares and cross-products rather than simply an average of squares. In this case, the quantity

$$(T-t^*)\,V^{-1}\,(T-t^*)'$$

is approximately F distributed, with degrees of freedom equal to k and ν, with ν defined as above but with a matrix generalization of r_M:

$$r_M = (1+M^{-1})\,\mathrm{Trace}(B_M U^{*-1})/k .$$

By the same reasoning as used for the normal approximation for scalar t, a chi-square distribution on k degrees of freedom often suffices.

8.4.3 Biases in Secondary Analyses

Statistics t^* that involve proficiencies in a scaled content area and variables included in the conditioning variables y^c, are consistent estimates of the corresponding population values T. Statistics involving background variables y that were not conditioned on, or relationships among proficiencies from different content areas, are subject to asymptotic biases whose magnitudes depend on the type of statistic and the strength of the relationships of the nonconditioned background variables to the variables that were conditioned on and to the proficiency of interest. That is, the large sample expectations of certain sample statistics need not equal the true population parameters.

The direction of the bias is typically to underestimate the effect of nonconditioned variables. For details and derivations, the interested reader is referred to Beaton and Johnson (1987), Mislevy (1988), and Mislevy and Sheehan (1987, section 10.3.5). For a given statistic t^* involving one content area and one or more nonconditioned background variables, the magnitude of the bias is related to (1) the extent to which observed responses $\mathbf{x}$ account for the latent variable θ, and (2) the degree to which the nonconditioned background variables are explained by conditioning background variables. The first factor--conceptually related to test reliability--acts consistently in that greater reliability reduces biases in all secondary analyses. (This salutary effect is roughly proportional to the average number of items in a content area the respondents are administered.) The second factor acts to reduce biases in certain analyses but increase it in others. In particular,

- High shared variance between conditioned and nonconditioned background variables mitigates biases in analyses that involve only proficiency and nonconditioned variables, such as marginal means or regressions.

- High shared variance exacerbates biases in regression coefficients or conditional effects for nonconditioned variables, when nonconditioned and conditioned background variables are analyzed jointly as in multiple regression.

In the 1984 NAEP reading assessment, the magnitude of shrinkage for the subgroup means of a background variable that was not conditioned on averaged about 15 percent. Biases in multiple regressions that included conditioning variables averaged about 35 percent. These values may be taken as approximate lower bounds for shrinkage for similar analyses with total reading, mathematics, and science proficiencies in the 1986 assessment, as the total proportion of variation in proficiency accounted for by item and conditioned-background responses is very similar--values between 80 and 90 percent, as compared to the 80-percent values attained with 1984 reading (see Table 8.1). Somewhat higher degrees of shrinkage are possible in subscale areas, but may be mitigated by the fact that four times as many background variables were included in the conditioning vector this year. Thus more analyses of important variables are free from such biases (i.e., those variables that have been conditioned on), which unequivocally improves the

Table 8.1
Proportions of Proficiency Variance Accounted For

		Percent Variance Accounted for by...			
Grade/Age	Scale	Background Only	Background + Items	Items given Background	Items Only*
3/9	Reading	.505	.836	.669	.803
7/13	Reading	.508	.813	.621	.769
11/17	Reading	.450	.827	.685	.798
3/9	Science Composite	.696	.827	.432	.714
	Life Science	.528	.726	.418	.604
	Nature of Science	.485	.667	.354	.515
	Physical Science	.509	.719	.428	.604
7/13	Science Composite	.784	.873	.410	.763
	Life Science	.564	.745	.415	.619
	Chemistry	.526	.670	.303	.478
	Nature of Science	.613	.750	.355	.587
	Physics	.467	.636	.318	.467
	Earth & Space	.552	.728	.393	.591
11/17	Science Composite	.819	.892	.405	.790
	Life Science	.599	.771	.428	.651
	Chemistry	.659	.774	.336	.598
	Nature of Science	.608	.761	.391	.621
	Physics	.591	.745	.378	.597
	Earth & Space	.576	.727	.356	.566
3/7	Mathematics Composite	.681	.838	.493	.753
	Measurement	.543	.736	.423	.616
	High-level Applic.	.528	.722	.411	.597
	Number Skills	.501	.741	.481	.650
7/13	Mathematics Composite	.741	.890	.576	.840
	Measurement	.601	.781	.450	.673
	High-level Applic.	.618	.795	.462	.692
	Number Skills	.511	.806	.602	.756
	Geometry	.598	.730	.329	.550
11/17	Mathematics Composite	.810	.926	.612	.892
	Measurement	.657	.822	.480	.730
	High-level Applic.	.661	.860	.586	.807
	Number Skills	.509	.793	.579	.737
	Geometry	.672	.830	.484	.740
	Functions	.711	.841	.450	.739

*analogous to reliability in classical test theory situation; and those that have not been included are more likely to be related to others that have, which improves marginal analyses of those variables. The shrinkages to be expected in mathematics and science subscales, however, will be larger than those for areas as a whole due to their lower conditional reliabilities.

8.4.4 A Numerical Example

In order to provide a feel for how plausible values are used in subsequent analyses, this subsection gives some of the steps in the calculation of 1986 grade-level reading means and their estimation-error variances.

The weighted mean of the first plausible values of the 9,793 grade 3 students in the sample is 38.09, and the jackknife variance of these values is .03. Were these values true θ values, then 38.09 would be the estimate of the mean and .03 would be the estimation-error variance. The weighted mean of the second plausible values of the same students, however, is 37.95; the third, fourth, and fifth plausible values give weighted means of 37.99, 38.04, and 37.96. Since all of these figures are based on precisely the same sample of students, the variation among them is due to uncertainty about the students' θs, having observed their item responses and background variables. Taking the jackknife variance estimate from the first plausible value, .03, as our estimate U^* of sampling variance, and the variance among the five weighted means, .0034, as our estimate B of uncertainty due to not observing θ, we obtain as the final estimate V of total error variance $.03 + (1+5^{-1}) .0034 = .034$.

With U^* and B defined as above, and with M=5, we may obtain values for Rubin's (1987) indices characterizing the properties of the plausible-value-based estimate of the grade 3 mean:

- r, the relative increase in variance due to the latency of θ, is .1372.
- ν_∞, the degrees of freedom associated with the precision loss due to the latency of θ if the degrees of freedom for the complete-data statistic were infinite, is 274.

Corresponding values were also calculated for grade 7 and grade 11. The results are shown in Table 8.2.

Table 8.2
Estimation Error Variances and Related Coefficients
for the 1986 Grade-level Reading Assessments

Grade	U^*	B	V	r	ν_∞
3	.03	.003	.034	.137	274
7	.02	.001	.022	.088	640
11	.04	.002	.043	.071	901

8.5 OVERVIEW OF SCALES IN THE 1986 NAEP ASSESSMENT

Scale-score analyses based on IRT were carried out in the following subject areas in the main sample (BIB administration) of the 1986 NAEP assessment.

- Reading: 1 scale, scalar plausible values.
- Mathematics: 5 subscales, multivariate plausible values.
- Science: 6 subscales, multivariate plausible values.
- History: 1 scale, point estimates for each student.
- Literature: 1 scale, point estimates for each student.

The conditioning variables employed in the construction of plausible values for reading, mathematics, and science are listed in Table 8.4. Table 8.5 gives details of exactly how the background effects were coded in order to produce the conditioning vector y^c. Conditional effect parameters Γ and the associated residual covariances Σ were estimated separately in each subject area and in each grade/age. Additional information on these analyses is presented in Chapters 9, 10, 11, and 13.

IRT scale-score analyses were also carried out separately in bridge samples, which differed substantially in administration procedures and are not to be merged with the main-sample scale-score data:

- Mathematics, bridge sample, paced administration: 1 scale, plausible values.
- Science, bridge sample, paced administration: 1 scale, plausible values.

Additional information on these analyses appears in Chapters 10 and 11, following the discussion of the main-sample analyses.

The weighted average response method (WARM) was used to construct sets of composite background variables for each grade/age and for each of the subject areas of reading, mathematics, and science. Between 4 and 8 WARM composites were specified for each grade/age and subject area, each of these composites being defined as averages of subsets of the background and attitude questions related to that subject area which were also presented to the students of that grade/age. The number of such composites, by grade/age and subject area, are shown in Table 8.3. The names of the WARM variables, along with short descriptors, are given in the subject area chapters.

Table 8.3
Number of WARM Composite Variables
by Subject Area and Grade/Age

Grade/Age	Reading	Mathematics	Science
Grade 3/Age 9	5	5	5
Grade 7/Age 13	4	6	7
Grade 11/Age 17	4	6	8

The questions comprising each of the final set of 50 WARM composites appear in Appendix C in Tables C.1, C.2, and C.3 (for reading); Tables C.5, C.6, and C.7 (for mathematics); and Tables C.9, C.10, and C.11 (for science). The conditioning background variables used in their construction appears in Table 8.4. The mapping of the original responses to the questions to the scaled and oriented responses used for the WARM composites appears in Tables C.4, C.8, and C.12 respectively for reading, mathematics, and science.

Table 8.4

Variables Conditioned on for 1986 by Grade/Age

Grade 3/Age 9	Grade 7/Age 13	Grade 11/Age 17
Overall	Overall	Overall
Gender	Gender	Gender
Ethnicity	Ethnicity	Ethnicity
STOC	STOC	STOC
Region	Region	Region
Parents' Education	Parents' Education	Parents' Education
Items in the Home	Items in the Home	Items in the Home
TV Watching	TV Watching	TV Watching
Homework	Homework	Homework
Home Language Minority (self) crossed with Ethnicity	Home Language Minority (self) crossed with Ethnicity	Home Language Minority (self) crossed with Ethnicity
Percent in Lunch Program	Percent in Lunch Program	Percent in Lunch Program
Percent White in School	Percent White in School	Percent White in School
Ethnicity by Gender	Ethnicity by Gender	Ethnicity by Gender
Ethnicity by Parents' Education	Ethnicity by Parents' Education	Ethnicity by Parents' Education
Age by Grade	Age by Grade	Age by Grade
Public v. Private School	Public v. Private School	Public v. Private School
Family Asks About Schoolwork	Family Asks About Schoolwork	Family Asks About Schoolwork
Went to Preschool	Went to Preschool	Went to Preschool
Single/Multiple Parent Home	Single/Multiple Parent Home	Single/Multiple Parent Home
Mother at Home	Mother at Home	Mother at Home
Mother Works Outside Home	Mother Works Outside Home	Mother Works Outside Home
Time Spent Studying Science	Use Computers for Math	Grades in School
Use Computers for Math	Type of Math Class In	High School Program
Adult Supervision of Student after School	Studying in Science this Year	Number of Math Courses
	Grades in School	Number of Science Courses
First Quantile*	First Quantile*	Post-Secondary Plans
Second Quantile*	Second Quantile*	Hours of Outside Work
Sample Type (Reading only)	Sample Type (Reading only)	Type of English Class In
		First Quantile*
		Second Quantile*

* When reading is the subject area being analyzed, the variables "First Quantile" and "Second Quantile" refer to a respondent's booklet-based percent-correct scores in mathematics and science. When mathematics is being analyzed, the variables refer to reading and science. When science is being analyzed, the variables refer to reading and mathematics. Quantiles are obtained by trichotomizing percentiles; a student is designated as either in the lowest quarter, the middle half, or the upper quarter. Students not receiving any items of the type in question are coded in the same manner as those who had received some items and were found to be in the middle half.

Table 8.5

Contrast Codings for 1986 Conditioning Variables

Variable Name	Ages	Variable Coding	Contrast Coding*
Overall	All	---	1
Gender	All	1 Male	0
		2 Female	1
Ethnicity	All	1 White	000
		2 Black	100
		3 Hispanic	010
		4 Asian American	001
		5 American Indian	000
		6 Unclassified	000
		BLK Missing	000
STOC	All	1 Low Metro	00
		2 High Metro	10
		3 All Others and Missing	01
Region	All	1 Northeast	000
		2 Southeast	100
		3 Central	010
		4 West	001
Parents' Education	All	1 < High School	0000
		2 High School Grad	1000
		3 Post-High School	0100
		4 College Grad	0010
		BLK Missing and I Don't Know	0001
Items in the Home	All	1 0 to 3 of the five items	00
(Items asked about are Newspaper, Dictionary, >25 Books, Encyclopedia, and Magazines. Three or more missing = Missing.)		2 Four of the five items	10
		3 Five of the five items	01
		BLK Missing	00

* Multicolumn entries without overbars indicate multiple contrasts. "Items in the home", for example, induces two contrasts: A response of 2 vs. all other responses, and a response of 3 vs. all other responses. Barred columns treated as one contrast

Table 8.5
(continued)

Variable Name	Ages	Variable Coding	Contrast Coding*
TV Watching	All	1 None	0 $\overline{00}$
		2 One hour or less per day	1 01
		3 Two hours	2 04
		4 Three hours	3 09
		5 Four hours	4 16
		6 Five hours	5 25
		7 Six or more hours per day	6 36
		BLK Missing	3 09
Home Language Minority by Ethnicity	All	Yes and Hispanic	100
		Yes and Asian American	110
		Yes and other Ethnicity	101
		No and Missing	000
Homework	9	1 None	10
		2 < 15 minutes	11
		3 1/2 hour	12
		4 One hour	13
		5 > One hour	14
		BLK Missing	00
	13, 17	1 Don't have any	100
		2 Don't do any	010
		3 1/2 hour	011
		4 One hour	012
		5 Two hours	013
		6 > Two hours	014
		BLK Missing	000
Percent in Lunch Program	All	0	$\overline{000}$ 0
		1	001 0
		2	002 0
		.	.
		.	.
		99	099 0
		100	100 0
		BLK	000 1

* Multicolumn entries without overbars indicate multiple contrasts. Barred columns treated as one contrast.

Table 8.5
(continued)

Variable Name	Ages	Variable Coding	Contrast Coding*
Percent White in School	All	0 - 49 White Minority	100
		50 - 79 Integrated	010
		80 - 100 Predominantly White	001
		BLK Missing	000
Ethnicity by Gender	All	White, Other, & Missing Male	000
		Black Male	000
		Hispanic Male	000
		Asian American Male	000
		White, Other, & Missing Female	000
		Black Female	100
		Hispanic Female	010
		Asian American Female	001
Ethnicity by Parents' Education	All	White, Other, & Missing < HS	000000000000
		White, Other, & Missing HS Grad	000000000000
		White, Other, & Missing Post HS	000000000000
		White, Other, & Missing Co Grad	000000000000
		White, other, & Missing Unknown	000000000000
		Black < HS	000000000000
		Black HS Grad	100000000000
		Black Post HS	010000000000
		Black College Grad	001000000000
		Black Unknown	000100000000
		Hispanic < HS	000000000000
		Hispanic HS Grad	000010000000
		Hispanic Post HS	000001000000
		Hispanic College Grad	000000100000
		Hispanic Unknown	000000010000
		Asian American < HS	000000000000
		Asian American HS Grad	000000001000
		Asian American Post HS	000000000100
		Asian American College Grad	000000000010
		Asian American Unknown	000000000001
Age by Grade	All	1 < Modal Age, Modal Grade	0000
		2 Modal Age, < Modal Grade	1000
		3 Modal Age, Modal Grade; and Missing	0100
		4 Modal Age, > Modal Grade	0010
		5 > Modal Age, Modal Grade	0001

* Multicolumn entries without overbars indicate multiple contrasts. Barred columns treated as one contrast.

Table 8.5
(continued)

Variable Name	Ages	Variable Coding	Contrast Coding*
Public v. Private Schools	All	1 Public	0
		2 Private	1
		3 Catholic	1
		4 Bureau of Indian Affairs	1
		5 Dept. of Defense	1
		BLK Missing	1
Family Asks About School-work	All	1 Almost Every Day	1
		2 Once a Week	0
		3 Once a Month	0
		4 Never	0
		BLK Missing	0
Went to Preschool	All	1 Yes	1
		2 No	0
		3 I Don't Know	0
		BLK Missing	0
Single/Multiple Parent Home	All	1 Yes to Father and Mother at Home	1
		2 Any Other Responses	0
		BLK Missing	0
Mother at Home	9	1 Works Outside	1
		2 Doesn't Work Outside	1
		3 Mother Not at Home	0
		BLK Missing	0
	13, 17	1 Works Outside Full-Time	1
		2 Works Outside Part-Time	1
		3 Doesn't Work Outside	1
		4 Mother Not at Home	0
		BLK Missing	0
Mother Works Outside of Home	9	1 Works Outside	1
		2 Doesn't Work Outside	0
		3 Mother Not at Home	0
		BLK Missing	0
	13, 17	1 Works Outside Full-Time	1
		2 Works Outside Part-Time	1
		3 Doesn't Work Outside	0
		4 Mother Not at Home	0
		BLK Missing	0

* Multicolumn entries without overbars indicate multiple contrasts. Barred columns treated as one contrast.

Table 8.5
(continued)

Variable Name	Ages	Variable Coding	Contrast Coding*
Time Spent Studying Science	9	1 Daily	10
		2 Several Times a Week	10
		3 Once a Week	10
		4 < Once a Week	01
		5 Never	01
		BLK Missing	00
Use Computers for Math	9, 13	1 Yes	1
		2 No	0
		BLK Missing	0
Adult Supervision of Student after School	9	1 Yes	1
		2 No	0
		BLK Missing	0
Type of Math Class In	13	1 None	000
		2 Regular Math	100
		3 Pre-Algebra	010
		4 Algebra	001
		5 Other	001
		BLK Missing	000
Studying in Science this Year	13	1 None	0000
		2 Life Science	1000
		3 Physical Science	0100
		4 Earth Science	0010
		5 General Science	0001
		6 Other	0001
		BLK Missing	0000
Grades in School	13, 17	1 A	$\overline{4.0}$
		2 A-B	3.5
		3 B	3.0
		4 B-C	2.5
		5 C	2.0
		6 C-D	1.5
		7 D	1.0
		8 < D	0.5
		BLK Missing	2.0

* Multicolumn entries without overbars indicate multiple contrasts. Barred columns treated as one contrast.

Table 8.5
(continued)

Variable Name	Ages	Variable Coding	Contrast Coding*
High School Program	17	1 General	00
		2 College Preparatory	10
		3 Vocational, Technical	01
		BLK Missing	00
Number of Math Courses Taken (Classes asked about: General Business, Pre-Algebra, 1st year Algebra, 2nd year Algebra, Geometry, Trigonometry, Pre-Calculus, Calculus.)	17	0 None of the seven classes	0
		1 One of the seven classes	1
		2 Two of the seven classes	2
		3 Three of the seven classes	3
		4 Four of the seven classes	4
		5 Five of the seven classes	5
		6 Six of the seven classes	6
		7 Seven of the seven classes	7
		BLK Missing	0
Number of Science Courses Taken (Classes asked about: General Science, Biology, Chemistry, Physics.)	17	0 None of the four classes	0
		1 One of the four classes	1
		2 Two of the four classes	2
		3 Three of the four classes	3
		4 Four of the four classes	4
		BLK Missing	0
Post-Secondary Plans	17	1 Work Full Time	00
		2 Two-year College	10
		3 Four-year College	01
		4 Other	00
		BLK Missing	00
Hours of Outside Work	17	1 None	0
		2 < 6 Hours	1
		3 6 to 10 Hours	1
		4 11 to 15 Hours	1
		5 16 to 20 Hours	1
		6 21 to 25 Hours	1
		7 26 to 30 Hours	1
		8 > 30 Hours	1
		BLK Missing	0
Type of English Class In	17	1 Not Taking	00
		2 Advanced Placement	10
		3 College Preparatory	10
		4 General	00
		5 Remedial	01
		BLK Missing	00

* Multicolumn entries without overbars indicate multiple contrasts. Barred columns treated as one contrast.

Table 8.5
(continued)

Variable Name	Ages	Variable Coding	Contrast Coding*
Reading Quantile	All	0 Missing	$\overline{0}$
		1 Lower Quarter	-1
		2 Middle Half	0
		3 Upper Quarter	1
Math Quantile	All	0 Missing	$\overline{0}$
		1 Lower Quarter	-1
		2 Middle Half	0
		3 Upper Quarter	1
Science Quantile	All	0 Missing	$\overline{0}$
		1 Lower Quarter	-1
		2 Middle Half	0
		3 Upper Quarter	1
Sample Type (Reading only)	9, 13	1 BIB	1
		2 Bridge	0

* Multicolumn entries without overbars indicate multiple contrasts. Barred columns treated as one contrast.

CHAPTER 9

Reading Data Analysis

Chapter 9

READING DATA ANALYSIS[1]

Rebecca Zwick

Educational Testing Service

9.1 SAMPLING OF STUDENTS AND ITEMS

In 1986, reading items were administered to subsets of the spiral samples at all three grade/age levels and to all students in the Bridge A samples at the two lower age levels. Further detail on these samples is given in Chapter 1. In brief, the purpose of the Bridge A samples was to allow measurement of the effects of changes in age definition and time of testing. Since there were no such changes at grade 11/age 17, no Bridge A sample was needed. The table below gives the number of students in each of the five samples listed above who received at least one reading block, the total number of reading scale items administered to each sample, and the number of reading scale items common to the 1984 assessment.

Table 9.1
Reading Scale Item Information, by Sample

Sample	No. of Cases	No. of Reading Scale Items	No. of Reading Scale Items Common to 1984
Grade 3/Age 9 Spiral	11,575	68	48
Grade 3/Age 9 Bridge A	6,932	31	31
Grade 7/Age 13 Spiral	11,171	61	43
Grade 7/Age 13 Bridge A	6,200	25	25
Grade 11/Age 17 Spiral	20,535	61	43

In total, 107 reading scale items were administered in 1986; 76 of these items had also been administered in 1984. Four of these items were open-ended; the remainder were multiple-choice. Two of the four were administered at all three age levels, the remaining two at the two upper age levels only. These items were rated on four- or five-point scales by professional judges, as described in Chapter 6.2. For purposes of item response theory (IRT) scaling, these ordinal scores were then dichotomized using rules provided by reading experts (Table 9.2).

---

[1] Laurel Barnett, David Freund, Bruce Kaplan, Laura McCamley, and Minhwei Wang provided statistical programming. Robert Mislevy, Kathleen Sheehan, and Eugene Johnson provided consultation on IRT and WARM scaling.

Table 9.2
Dichotomization Rules for Open-ended Reading Items Used in Scaling

NAEP ID	Cohort	Score Range for Valid Responses	Scores Considered Correct
N003104 Goods to Market	3/9, 7/13, 11/17	1 - 5	3 - 5
N021301 Jacob	3/9, 7/13, 11/17	1 - 4	2 - 4
N021801 Eggplant I	7/13, 11/17	1 - 5	3 - 5
N021805 Eggplant II	7/13, 11/17	1 - 4	3 - 4

Twelve reading items that had been excluded from the reading scale in 1984 were again excluded in 1986. Also, in the case of open-ended items, neither primary trait scores for Rater 2 nor secondary trait scores were scaled. Table 9.3 lists the reading item scores excluded from the scale, as well as the reasons for exclusion.

9.2 SCALING

In 1984, responses to reading items were summarized in a single reading scale, a decision that was supported by dimensionality analyses (see Beaton, 1987a and Zwick, 1987a). The IRT procedures applied to the 1986 reading scale items, more than 70 percent of which are common to 1984, are essentially the same as those used to scale the spiral data in 1984. Because these methods are extensively documented in Beaton (1987a) and in Chapter 8 of this report, only a brief outline of the scaling procedures is given here.

9.2.1 Steps in Scaling the 1986 Reading Data

9.2.1.1 Item Calibration

For all three grade/ages combined, the BILOG program (Mislevy & Bock, 1982) was used to obtain item parameter estimates on a provisional scale, based on the three-parameter logistic model. Parameters were estimated even for previously administered items; parameter values were not assumed equal to their 1984 values at this phase.

To reduce costs, a random sample of students was used for this item calibration phase. Table 9.4 gives the number of students in each sample that were included in the BILOG run.

Table 9.3

Reading Item Scores Excluded from IRT Scale

NAEP ID	SHORT LABEL	COHORT+	REASON FOR EXCLUSION
N003105	Goods: Primary trait score (Rater 2)	1,2,3	Supplementary score for scaled item*
N005701	Graph: Most power 1980, 1985, 2000-petroleum	2,3	Document literacy items - excluded as in 1984**
N005702	Graph: In 2000 hydropower supply less than coal	"	"
N005703	Graph: In 2000 nuclear power more % total than 1971	"	"
N006001	Phone Dir: Stores sell milk listed under dairies	"	"
N006002	Phone Dir: Hendricks mining on 63rd St, 443-1502	"	"
N006003	Phone Dir: Star Tracker open to repair microscope	"	"
N007101	Bus Sched: Last bus in evening leave Citadel 6:45pm	"	"
N007102	Bus Sched: 2nd Sat am bus arrv dwntwn 8:15am	"	"
N007103	Bus Sched: Miss 2:35pm from Hancock wait till 3:35	"	"
N007104	Bus Sched: Lv Rustic Wed 9:42am arrv dwntwn 10:15am	"	"
N010101	Sandwich: Liked reading it	1	Opinion item-excluded as in 1984**
N021302	Jacob: Secondary trait score: Circular evidence	1,2,3	Supplementary score for scaled item*
N021306	Jacob: Primary trait score (Rater 2)	"	"
N021308	Jacob: Secondary trait score: Personal experience	"	"
N021309	Jacob: Secondary trait score: Story content	"	"
N021802	Eggplant I: Secondary trait: details	2,3	"
N021804	Eggplant: What activities you think writer enjoys	"	Opinion item-excluded as in 1984**
N021806	Eggplant: Primary trait score (Rater 2)	"	Supplementary score for scaled item*
N021810	Eggplant II: Primary trait score (Rater 2)	"	"

+Cohort 1 - grade 3/age 9; cohort 2 - grade 7/age 13; cohort 3 - grade 11/age 17.

*See Chapter 6.2 for a description of primary and secondary trait scores. Note that when there are multiple scores for a single exercise, each score is assigned a separate NAEP ID.

**See Beaton (1987a) for further detail.

Table 9.4
Students Included in BILOG Run, by Sample

Grade/Age	Spiral	Bridge	Total
3/9	4,116	497	4,613
7/13	3,945	443	4,388
11/17	4,612	---	4,612

Note that 2,997 students from the Language Minority Probe, a NAEP add-on project, were also included in this phase of analysis, but not in subsequent phases. Students in each of the eight samples (the five above, plus one Language Minority sample at each grade/age) were treated as distinct subpopulations in the BILOG run. That is, in estimating the item parameters, the densities for these eight groups were not assumed to be the same. A graphical analysis of residuals was conducted to determine whether it was reasonable to assume common item response functions for these eight groups. For each item and each group, expected proportions-correct (see Beaton, 1987a, p. 302) for each of approximately eight proficiency levels were obtained. The departures of these proportions from the common estimated item response function were examined. No major or systematic departures were found, indicating that a common item response function was appropriate for all groups.

9.2.1.2 Rescaling of Item Parameters

Using the Stocking-Lord (1983) equating procedure, implemented in the TBLT program (Stocking, 1986), the item parameters were rescaled by deriving a linear equating function based on items common to 1984. This function was used to rescale parameter estimates for items new to 1986; the 1984 parameter estimates were used for old items. The equating procedure and a study of the error are described in Appendix D. The final parameter estimates are given in Tables E.1, E.2, and E.3 of Appendix E. Items common to the 1984 scale are indicated in the table. The item parameters were treated as known in all subsequent calculations. (The metric in which these parameters are reported is discussed in section 9.4.)

9.2.1.3 Proficiency Estimation

Using the iterative method described by Mislevy (1985) and implemented in the M-GROUP program (Sheehan, 1985), a reading proficiency (θ) distribution was estimated for each individual. M-GROUP was applied to each grade/age separately. Each iteration consists of the following steps:

1) Using the current estimates of the regression coefficients, Γ, and error variance, σ^2, associated with the regression of θ on the conditioning variables y^c, the distribution of θ is estimated for each individual (see

Equation 8.6). The distribution is assumed normal with mean Γy^c and variance σ^2. (In the first iteration, starting values must be assumed for Γ and σ^2.)

2) For each individual, standard Bayesian calculations (see Equation 8.5) are used to combine the (prior) distribution from a with a smoothed, normalized approximation to the likelihood based on that individual's observed item responses, yielding a posterior distribution for each individual.

3) Five "plausible values" are randomly selected from each individual's posterior distribution.

4) These plausible values are used to re-estimate the regression parameters Γ and σ^2.

5) Steps 1-4 are repeated until the changes in σ^2 and the elements of Γ are sufficiently small.

The final set of five plausible values drawn from each individual's distribution is then used for estimating group statistics.

The background information, or conditioning variables, used in the reading analysis are listed in Table 8.1 and the estimated effects are given in Tables B.1, B.2, and B.3 of Appendix B. (The absence of an estimated effect next to a variable name indicates that the variable was deleted in order to eliminate collinearities.) Note that the spiral and Bridge A samples were combined in the M-GROUP analysis for the two younger age groups, and that an indicator variable for spiral versus Bridge A sample was included as a conditioning variable. (As noted above, there was no bridge sample for grade 11/age 17.)

9.3 TREND ANALYSIS

Comparisons of the 1986 reading results for 9, 13, and 17-year-olds to the 1984 results suggested a large decrease in performance for 9- and 17-year-olds. These changes were evident in the item percents-correct, as well as the reading scale values. Because changes of this magnitude did not seem credible, NAEP did not report trend results in 1986. NAEP staff embarked on a year-long investigation of the possible reasons for the 1986 results. The NAEP Technical Advisory Committee (now the Design and Analysis Committee), statistical staff from the Office of Educational Research and Improvement (OERI), as well as other eminent statisticians and educational researchers, reviewed the results and helped to guide NAEP's investigative efforts. The analyses that were performed to explore the change in reading results are described in The NAEP 1985-86 Reading Anomaly: A Technical Report (Beaton, 1988). Among the issues discussed are sampling, administration, data entry, scoring, and scaling. Although the source of the change could not be conclusively determined, NAEP is now collecting data that will provide further information about the puzzling results in 1986. The 1988 data collection includes, at each age level, two special supplementary samples in addition to the 1988 sample. These additional samples duplicate as closely as possible the 1984 and 1986 assessments, respectively, in terms of sample definition, item booklets, and dates and conditions of administration. By comparing the reading results obtained from the three samples, estimates can be obtained of the effects of changes introduced in 1986 and in 1988. If these effects prove to be nonnegligible, NAEP plans to use the data from these supplementary samples as a basis for adjusting the 1986 and 1988 results so that they can reported in the same metric as the 1984 scale.

Although the 1986 and 1984 assessments differed in some ways and may not be comparable, the 1986 findings resemble past assessments and other reading measures in terms of patterns of subgroup difference, relation of reading proficiency to background variables, and relation of reading proficiency to performance in other subject areas, such as math and science. It was therefore decided to release a cross-sectional report only, using a scale metric that differed from the 1984 reading scale.

9.4 CROSS-SECTIONAL ANALYSIS

The 1986 reading cross-sectional report, Who Reads Best? (Applebee, Langer, and Mullis, 1988), is based on the students in the spiral samples who were in grades 3, 7, and 11. The reading scale was standardized to have a mean of 50 and a standard deviation of 10 for the three grade samples combined. To obtain results in terms of this metric, the scale values that would be obtained by using the item parameter estimates in Table E.1, E.2, and E.3 of Appendix E need to be transformed. Letting θ represent the proficiency metric that corresponds to the item parameters provided and letting RS represent the metric of the reporting scale, the required transformation is $RS = 10\theta + 50$. The corresponding changes to the item parameters are $a_{RS} = a_\theta/10$ and $b_{RS} = 10b_\theta + 50$. ($c_{RS} = c_\theta$.) See Appendix D for an explanation of the linkage between the θ metric and the 1984 reading scale.

Who Reads Best? contains analyses relating reading proficiency to background and attitude variables and to styles of reading instruction (as reported by the student). Several composites of background, attitude, and instruction variables were created, using the WARM method described in section 8.3. The questions comprising each of the reading WARM composites are given in Tables C.1, C.2, and C.3 of Appendix C. The score values that were assigned to the original responses to these questions for purposes of deriving the WARM scales are given in Table C.4 of Appendix C.

CHAPTER 10

Mathematics Data Analysis

Chapter 10

MATHEMATICS DATA ANALYSIS[1]

Eugene G. Johnson

Educational Testing Service

This chapter describes the analyses carried out on the responses to the cognitive and background items in the 1973-74, 1977-78, 1981-82 and 1986 assessments of mathematics which lead to the results presented in The Mathematics Report Card: Are We Measuring Up? (Dossey, Mullis, Lindquist, & Chambers, 1988). The emphasis is on the methods and results of the procedures used to develop the IRT-based scale-scores that formed the basis of that report. The theoretic underpinnings of the particular techniques discussed in this chapter are given in Chapter 8.

The techniques required to develop scale-scores for the cross-sectional analysis of the data from the 1986 BIB-spiral assessment were different from the techniques required to develop scale-scores for the analysis of trends in mathematics achievement. Accordingly, these two analyses are presented in separate sections.

Section 10.1 pertains to the scaling of the data from the spiral administration and describes the creation of mathematics content area subscales as well as a weighted-average composite over the subscales. Also discussed in this section are the procedures for the empirical behavioral anchoring that was carried out on the mathematics composite and the creation of the WARM composites of mathematics background questions. The techniques used to develop scale-scores for the measurement of trend in mathematics achievement are discussed in section 10.2.

10.1 SCALING OF THE CROSS-SECTIONAL MATHEMATICS DATA

The data from the spiral assessment of mathematics in 1986 were used for cross-sectional analyses comparing the levels of mathematics achievement for various subgroups of the 1986 target populations. It included three student cohorts: students who were either in the 3rd grade or 9-years-old; students who were either in the 7th grade or 13-years-old; and students who were either in the 11th grade or 17-years-old. So that the modal grades for the three age groups would be the 3rd, 7th, and 11th grades, the birthdate ranges for age-eligible students were established as October 1976 to September 1977 for age 9, October 1972 to September 1973 for age 13, and October 1968 to September 1969 for age 17. The sampled students in each of these three cohorts were assessed in the spring. (See Chapter 3 for a description of the target populations and the sample design used for the assessment).

---

[1] Data analysis and scaling were performed by David Freund, Maxine Kingston, Edward Kulick, Joling Liang, Laura McCamley, Jennifer Nelson, Norma Norris, Alfred Rogers, and Minhwei Wang. Robert Mislevy, Kathleen Sheehan, and Kentaro Yamamoto provided consultation on IRT scaling.

The pool of items used in the 1986 mathematics assessment contained a range of open-ended and multiple-choice questions measuring performance on sets of objectives developed by nationally representative panels of mathematics specialists, educators, and concerned citizens and documented in Math Objectives, 1985-86 Assessment (NAEP, 1986a). The objectives defined seven content areas and five process areas. The content areas were:

1) fundamental methods of mathematics;
2) discrete mathematics;
3) data organization and interpretation;
4) measurement;
5) geometry;
6) relations, functions, and algebraic expressions; and
7) numbers and operations.

The process areas were:

1) problem solving/reasoning;
2) routine applications;
3) understanding/comprehension;
4) skills; and
5) knowledge.

A total of 537 distinct mathematics items, addressing the above objectives, was administered in 1986 using a BIB-spiral design (Messick, Beaton, & Lord, 1983; Beaton, 1987a) to allocate the items to the assessed students (see Chapter 3). In this design, the entire 1986 assessment battery (including all subject areas assessed) was divided into blocks of approximately 15 minutes each, and each student was administered a booklet containing three blocks of content area materials as well as a six-minute block of background questions common to all students. Seven blocks of mathematics questions were administered at grade 3/age 9, nine blocks at grade 7/age 13, and eleven blocks at grade 11/age 17. At grade 3/age 9, 52 different booklets were prepared. Thirty-four of them contained one or more mathematics blocks, with each of the seven blocks appearing in six or eight booklets. Sixty-eight booklets were assessed at grade 7/age 13, 38 of which contained mathematics blocks; each mathematics block appeared in six to nine different booklets. Mathematics items were included in 41 of the 96 booklets administered to students at grade 11/age 17, with each block appearing seven to nine times.

10.1.1 Definition of Subscales

The analysis of the results of the spiral assessment was carried out using five subscales, each measuring a facet of mathematics, along with a composite defined as a weighted average of the subscales. The aim in the creation of subscales was to facilitate capturing essential subdivisions of mathematics, as indicated by the mathematics Learning Area Committee, in order to allow the detection of potential differences in performance patterns between those subdivisions.

The basis for the definition of the subscales ultimately created was the content areas and process areas defined by the mathematics learning area committee. In selecting subscale definitions, it was necessary to balance two requirements. Our aim was to scale subareas which were as narrowly defined as possible so that the assumptions of the scaling models are most nearly met and so that the capability to identify important interactions within subareas of mathematics would be maximized. Countering this aim was the requirement that the number of items taken by any individual student within a subarea be sufficient to support currently available scaling procedures. This latter requirement precluded the possibility of scaling within each of the 35 content by process cells since, in most of these cells, the small number of items taken by any individual student was insufficient to support current scaling technology.

As a result, we selected the content areas as the initial basis of the subscale definition. The numbers of items, by content area, are shown in Tables 10.1, 10.2 and 10.3 for grade 3/age 9, grade 7/age 13 and grade 11/age 17, respectively. (The splitting of the numbers and operations content area into two parts is discussed below). Also included in the tables is information about the distribution of the numbers of items taken by individual students within each content area. Since each student takes a single booklet, this information is presented in terms of the distribution of items per booklet. Included in the tables for each content area are the average numbers of items per booklet and the numbers of booklets with 1-2, 3-5, and more than 5 items within the content area.

Based on the counts shown in the tables, we decided that it was possible to analyze and report the following subscales:

	Grade/Age		
	3/9	7/13	11/17
Fundamental Methods	X	X	X
Measurement	X	X	X
Data Organization and Interpretation	X	X	X
Geometry		X	X
Relations and Functions			X
Numbers and Operations: Higher-level Applications	X	X	X
Numbers and Operations: Knowledge and Skills	X	X	X

Items in the remaining content categories (discrete mathematics for all grade/ages, geometry for grade 3/age 9, and relations and functions for grade

Table 10.1

Distribution of the Members of Items by Booklet Within Each of the Mathematics Content Areas

Grade 3/Age 9

Area	Total Items	Number of Booklets	Average Number of Items per Booklet	Number of Booklets with 1-2 Items	Number of Booklets with 3-5 Items	Number of Booklets with 6 or more Items
Fundamental Methods	102	25	4.1	9	8	8
Discrete Mathematics	18	11	1.6	10	1	0
Data Organization and Interpretation	96	19	5.1	3	10	6
Measurement	162	28	5.8	9	6	13
Geometry	36	11	3.3	5	5	1
Relations, Functions, and Algebraic expressions	48	25	1.9	20	5	0
Numbers and Operations: Higher-level Applications	156	28	5.6	9	6	13
Numbers and Operations: Knowledge and Skills	180	25	7.2	9	0	16

Table 10.2

Distribution of the Members of Items by Booklet Within each of the Mathematics Content Areas

Grade 7/Age 13

Area	Total Items	Number of Booklets	Average Number of Items per Booklet	Number of Booklets with more than		
				1-2 Items	3-5 Items	6 Items
Fundamental Methods	150	25	6.0	8	4	13
Discrete Mathematics	75	26	2.9	13	10	3
Data Organization and Interpretation	147	28	5.3	6	9	13
Measurement	306	32	9.6	4	7	21
Geometry	168	30	5.6	6	12	12
Relations, Functions, and Algebraic Expressions	91	30	3.0	14	12	4
Numbers and Operations: Higher-level Applications	455	32	14.2	2	2	28
Numbers and Operations: Knowledge and Skills	396	32	12.4	6	0	26

Table 10.3

Distribution of the Members of Items by Booklet Within each of the Mathematics Content Areas

Grade 11/Age 17

Area	Total Items	Number of Booklets	Average Number of Items per Booklet	Number of Booklets with more than 1-2 Items	3-5 Items	6 Items
Fundamental Methods	287	35	8.2	4	9	22
Discrete Mathematics	139	35	4.0	9	18	8
Data Organization and Interpretation	183	32	5.7	3	14	15
Measurement	355	42	8.5	4	6	32
Geometry	325	39	8.3	2	11	26
Relations, Functions, and Algebraic Expressions	370	40	9.3	5	12	23
Numbers and Operations: Higher-level Applications	508	42	12.1	1	8	33
Numbers and Operations: Knowledge and Skills	523	39	13.4	6	3	30

3/age 9 and grade 7/age 13) were not included in any subscales, since consultation with mathematics experts indicated that it would be inappropriate to recluster these items into other content categories.

Because there were so many items in the numbers and operations content area, we felt that it would be feasible and preferable to split these items into two subclassifications defined by process area. We thus created the two subclassifications of numbers and operations:

1) Higher-level applications--consisting of the problem solving/reasoning, routine application, and understanding/comprehension process areas; and

2) Knowledge and skills--consisting of the skills and knowledge process areas.

This resulted in seven subscale areas encompassing a total of 446 unique noncalculator items. (Since items requiring the use of a calculator involve somewhat different skills than items which do not allow the use of a calculator, and since there were too few items per respondent to support a subscale, the calculator items presented in the 1986 spiral assessment were excluded from the scaling process. Analyses of achievement involving these calculator items were based on the percent-correct metric.)

10.1.2 Estimation of Item Parameters for the Subscales

The next step in the scaling process was the estimation of item parameters for the items in each of the seven defined subscales. This item calibration was performed separately for each of the seven subscales, using data from all of the grade/age populations for which the subscale was defined. Thus, five of the subscales, which were defined for all three grade/age populations, were calibrated using data from all three grade/ages. The geometry subscale was calibrated using data from the two grade/ages for which it was defined, grade 7/age 13 and grade 11/age 17. Since the relations and functions subscale was defined only for grade 11/age 17, only those students were used in the estimation of its item parameters.

The calibration for each subscale used the BILOG program and was performed on an approximately quarter sample of all the available subjects, resulting in approximately 1,000 examinees in each grade/age for each item. (See Beaton, 1987a, for further description of the calibration process.)

In the course of calibration, item fit was evaluated by inspecting residuals from the fitted item response curves. In this inspection, the expected proportions of correct responses to the item for each grade/age at various points along the subscale were compared with the fitted three-parameter logistic item response curve. The expected proportions were calculated without assuming any functional form. As a result of these examinations, 11 items were identified as displaying differential subpopulation functioning, in that the expected proportions for one of the grade/age populations deviated significantly from the item response curve.

Each of these 11 items were removed from the scaling of the offending grade/age group but were included in the scaling of the other grade/age groups who were presented the item and whose expected proportions did not appear aberrant. These items, along with the grade/age group excluded, appear in Table 10.4.

An additional 79 items were removed from the scaling process because of very high rates of students not reaching the item. (An unanswered item occurring after the last valid response in a block is considered not reached.) Table 10.5 shows the distribution, by subscale, of the item level rates of nonresponse. The 79 items, which were excluded from the scaling at all grade/ages, had a nonresponse rate of at least 45 percent and are listed in Table 10.6. The cutoff value of 45 percent was selected for utilitarian reasons in order to ensure that at least 10 items remained in each subscale at each grade/age level. Because we were concerned about the effect that the exclusion of these parameters would have on the ultimate subscales, we compared the estimates of the item difficulty parameters for the retained items when these high nonresponse items were included in the calibration with the equivalent item difficulties estimated after excluding the high nonresponse items. Very little difference in the item difficulties were found; the two sets of estimates when plotted against each other lay very tightly along a line of unit slope through the origin.

The result at the end of the calibration phase was seven subscales consisting of a total of 367 items, distributed by grade/age and subscale as shown in Table 10.7. For reasons given in the next section, two of these subscales (fundamental methods and data organization and interpretation) were later excluded from the computation of plausible values. A list of the items scaled in the five retained subscales, along with their item parameters appears in Tables E.4 through E.15 in Appendix E. (These parameters are in the metrics of the original calibration of the subscales. See section 10.1.5 for the transformation of the item parameters into the metric of the final reporting subscales.)

10.1.3 Generation of Multivariate Plausible Values for the Subscales

The next step in the scaling of mathematics was the generation of plausible values for each of the subscales. The construction of plausible values for the subscales used the multivariate procedures given in section 8.3.3. As described there, since a multivariate distribution was assumed for the proficiencies of an individual across the various subscales, plausible values were generated as vectors. That is, the first plausible values (one for each subscale) for a given examinee were generated as a draw from the multivariate distribution $p(\underline{\theta}|x_i,y_i)$, where $\underline{\theta}$ is a vector, x_i are the subject's item responses to all items in all subscales, and y_i are the subject's observed values on the conditioning variables.

Table 10.4

Mathematics Items Deleted for Specified Populations Because of Differential Functioning

NAEP ID	BILOG Item No.	Subscale Number	Subscale Name	Age Group Deleted	Age Group Remaining
N262501	51	1	Fundamental Methods	9	13, 17
N262502	52	1	Fundamental Methods	9	13, 17
N263501	85	2	Data Organization	9	13, 17
N236401	92	3	Measurement	13	9
N269001	144	3	Measurement	9	13, 17
N208301	329	4	Numbers and Operations: Higher-level Applications	13	17
N287101	405	5	Numbers and Operations: Knowledge and Skills	13	17
N287102	406	5	Numbers and Operations: Knowledge and Skills	13	17
N286501	443	5	Numbers and Operations: Knowledge and Skills	13	17
N286502	444	5	Numbers and Operations: Knowledge and Skills	13	17
N219301	193	6	Geometry	13	17

Table 10.5

Number of Items by Subscale and Percent Not Reached All Grade/Ages

Subscale	Percent Not Reached 0-9%	10-19%	20-29%	30-44%	45% and Over	Total
Fundamental Methods	14	6	11	5	16	52
Data Organization and Interpretation	19	4	2	3	8	36
Measurement	30	16	12	9	5	72
Geometry	18	9	7	6	3	43
Relations, Functions, and Algebraic Expressions	20	8	4	6	9	47
Numbers and Operations: Higher-level Applications	35	14	20	9	27	105
Numbers and Operations: Knowledge and Skills	58	12	4	6	11	91
Total	194	69	60	44	79	

Table 10.6

Mathematics Items Deleted Because Percent Nonresponse ≥ 45 (Based on Calibration File)

Fundamental Methods

N203701 N216901 N217701 N219501
N219701 N220201 N220301 N220601
N227401 N228301 N221101 N220901
N221201 N221601 N221701 N221801

Data Organization and Interpretation

N224401 N263001 N231301 N225001
N229201 N229202 N229203 N224301

Measurement

N230601 N217801 N232601 N219401
N269401

Numbers and Operations: Higher-level Applications

N200701 N200702 N273901 N201801
N206301 N227201 N258501 N256801
N203001 N237501 N204201 N258901
N204801 N205001 N230301 N263801
N204701 N207701 N235301 N278901
N278902 N278903 N278904 N279401
N285301 N237401 N207501

Numbers and Operations: Knowledge and Skills

N283001 N201201 N201301 N273901
N256801 N258901 N260301 N278901
N278902 N278903 N278904

Geometry

N253201 N233101 N229601

Relations and Functions

N255801 N230001 N211001 N211501
N212101 N212201 N212301 N212501
N212601

Table 10.7

Number of Mathematics Items Scaled by Subscale and Grade/Age

Subscale	Total	Grade 3/ Age 9	Grade 7/ Age 13	Grade 11/ Age 17
Fundamental Methods	36	15	19	21
Data Organization and Interpretation	28	15	16	16
Measurement	67	26	45	39
Geometry	40	--	24	37
Relations and Functions	38	--	--	38
Numbers and Operations: Higher-level Applications	78	23	50	55
Numbers and Operations: Knowledge and Skills	80	30	56	56
Total	367	109	210	262

Originally, all seven subscales were included in the generation of the plausible values. However, the results of this initial wave of estimation indicated that the approximations necessary to accomplish multivariate scaling with currently available resources and techniques produced unacceptable results in the case of two of the subscales.

Table 10.8 shows the means and standard deviations, by grade/age group, for the first plausible value of each of the seven subscales. If the estimation procedure is operating correctly, these means and standard deviations, which are based on the multivariate plausible values, should be close to the grade/age group means and standard deviations obtained when each subscale is fit separately. The univariate estimates of the subscale means and standard deviations appear in the columns headed by "BILOG" (since they are obtained as a byproduct of the univariate BILOG item calibration runs). It can be seen from the table that the correspondence between the two sets of estimates is generally good for the bottom five subscales listed in the table (i.e. measurement and below) but that the correspondence is noticeably poorer for the first two subscales (fundamental methods, data organization and interpretation). For both of these subscales, the estimated standard deviation based on the plausible values is markedly larger within each grade/age group than the corresponding univariate estimate. Additionally, the differences between the means of the two estimates tends to be larger for these two subscales than for the remaining five subscales, particularly for the grade 11/age 17 students.

Table 10.8

Comparison of the Subscale Means and Standard Deviations Based on the Multivariate Plausible Values with the Univariate BILOG Results

	Grade 3/Age 9				Grade 7/Age 13				Grade 11/Age 17			
	1st Plaus. Value		BILOG		1st Plaus. Value		BILOG		1st Plaus. Value		BILOG	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Fundamental Methods	-.82	.90	-.73	.64	.13	.82	.10	.63	.88	1.06	.92	.93
Data Organization and Interpretation	-.60	.92	-.68	.82	.58	.81	.54	.67	1.19	.83	1.13	.69
Measurement	-.89	.66	-.86	.59	.18	.68	.16	.64	.90	.76	.87	.76
Numbers and Operations: Higher-level Applications	-.74	.74	-.83	.69	.17	.67	.17	.62	.98	.67	.95	.68
Numbers and Operations: Knowledge and Skills	-.84	.82	-.84	.81	.36	.67	.32	.69	.85	.60	.84	.61
Geometry	----	----	----	---	-.58	.87	-.43	.77	.52	1.07	.48	1.04
Relations and Functions	----	----	----	---	---	---	----	---	.00	1.02	.00	1.00

These discrepancies are likely due to the fact that relatively few items within these two subscales are taken by any individual. This could mean that the normalized-likelihood/normal posterior approximation which was used in the generation of plausible values is not performing adequately for these two subscales.

Because a multivariate scale was desired, and because time and resources precluded the development of improved approximations to the multivariate posterior distribution of the proficiencies, the decision was made to drop the fundamental methods and the data organization and interpretation subscales from the analysis. New sets of vectors of plausible values were generated for the five retained subscales. The estimation of plausible values was conducted independently for each of the three grade/age groups, estimating vectors of plausible values for all subscales defined for a given grade/age. That is, three subscales are defined for grade 3/age 9, four subscales for grade 7/age 13, and five subscales for grade 11/age 17. The conditioning variables and the estimated conditioning effects (the Γ of equation 8.6) are given in Tables B.4 through B.9 in Appendix B for the three grade/age groups. (The values of the conditioning effects are in the metrics of the original calibration of the subscales. Section 10.1.5 provides the transformation to the metric of the final reporting subscales).

10.1.4 Initial Resolution of Linear Indeterminacies of the Subscales

Like all IRT scales, the mathematics subscales have a linear indeterminacy which may be resolved by an arbitrary choice of the origin and unit-size in each given subscale. In the course of initial estimation of the item parameters and the plausible values, the origin and unit-size for each of the subscales was provisionally set so that the proficiencies for that subscale would have a mean of zero and a standard deviation of one over the populations for which that subscale was defined. Because three of the subscales spanned all three grade/age groups, while one subscale was only defined for grade 7/age 13 and grade 11/age 17 and one subscale was defined only for grade 11/age 17, this initial choice of origin and unit-size resulted in different means and standard deviations across the subscales for the three grade/age groups, as shown in Table 10.8. For the purposes of comparing achievement between subscales, as well as to facilitate the definition of a mathematics composite, it is useful to have comparable origins and unit-sizes for each of the five subscales. This was accomplished in two steps. In the first step, intermediate transformations of each of the subscales were applied so that the age group differences across the various subscales would be approximately equal to each other. In the second step, the subscales were additionally transformed to match the units of the composite, which is defined in the next section.

For the three subscales that spanned all three grade/ages, the intermediate transformation was accomplished by matching the age 9 and age 17 mathematics means on each subscale to the corresponding averages of the age group means across the three subscales. That is, let the means, by age, of the initial subscale proficiencies be as follows:

Subscale	Age 9	Age 13	Age 17
Measurement	$\theta^0_{1,9}$	$\theta^0_{1,13}$	$\theta^0_{1,17}$
N & O (H-L)	$\theta^0_{2,9}$	$\theta^0_{2,13}$	$\theta^0_{2,17}$
N & O (K & S)	$\theta^0_{3,9}$	$\theta^0_{3,13}$	$\theta^0_{3,17}$

Further, let the averages across the three age-spanning subscales for the age 9 and the age 17 samples be

$$\bar{\theta}^0_9 = (\theta^0_{1,9} + \theta^0_{2,9} + \theta^0_{3,9}) / 3 \quad \text{, and}$$

$$\bar{\theta}^0_{17} = (\theta^0_{1,17} + \theta^0_{2,17} + \theta^0_{3,17}) / 3 \quad .$$

Then the intermediate transformed value for an initial measurement subscale proficiency value of θ^0_1 is

$$\theta^1_1 = \bar{\theta}^0_9 + (\theta^0_1 - \theta^0_{1,9})(\bar{\theta}^0_{17} - \bar{\theta}^0_9) / (\theta^0_{1,17} - \theta^0_{1,9})$$

and the intermediate transformed values for the remaining two age-spanning subscales are analogously defined. Note that this method permits means to vary for the age 13 samples.

For the geometry subscale, which appeared in only the higher two age groups, the age 17 mean was matched to the average of the age 17 means across the three age spanning subscales, but the age 13 mean was matched to the average transformed age 13 mean obtained in the three mathematics subscales that spanned all three ages. That is, the intermediate transformed value for an initial geometry subscale proficiency value of θ^0_4 is

$$\theta^1_4 = \bar{\theta}^1_{13} + (\theta^0_4 - \theta^0_{4,13})(\bar{\theta}^0_{17} - \bar{\theta}^1_{13}) / (\theta^0_{4,17} - \theta^0_{4,13})$$

where $\theta^0_{4,13}$ and $\theta^0_{4,17}$ are the geometry initial proficiency means for ages 13 and 17 and where

$$\bar{\theta}^1_{13} = (\theta^1_{1,13} + \theta^1_{2,13} + \theta^1_{3,13}) / 3$$

is the average of the transformed age 13 mean values for two subscales--measurement, numbers and operations: higher-level and numbers and operations: knowledge and skills.

Finally, for the relations and functions--algebra subscale, which appeared only at age 17, the intermediate transformed value for an initial proficiency of θ^0_5 was set to

$$\theta^1_5 = \theta^0_{17} + (\theta^0_5 - \theta^0_{5,17})\,\bar{\sigma}$$

where $\theta^0_{5,17}$ is the initial proficiency mean for age 17 and where $\bar{\sigma}$ is the geometric mean of σ^1_1, σ^1_2, σ^1_3, and σ^1_4 where σ^1_i is the standard deviation for the age 17 sample for the intermediate transformed value of the i^{th} subscale.

This method of scale determination constrains the age 9 means to be equal across subscales and the age 17 means to be equal across subscales, but the age 13 means can be expected to vary slightly.

10.1.5 Definition of the Mathematics Composite and Setting the Final Origin and Unit-Sizes

Although examination of results by subscale provides much useful information about how students perform on the facets of mathematics addressed by the subscales, this level of detail is too great for many purposes. High-level policymakers and the public at large have the need for a single index of performance in mathematics, to allow the summarization of overall performance. To fulfill this need, a mathematics composite was defined as a weighted average of the results across subscales. (The high correlations between the subscales within each of the three grade/age groups, shown in Table 10.9, shows that much information is shared between the subscales.)

The mathematics composite was defined separately for each grade/age as a weighted average of the estimated student proficiencies (plausible values) for the subscales appearing in that grade/age (after the intermediate transformations of the last section), with weights that reflect the number of items in that subscale on the assessment for that grade/age. (The weights were in fact proportional to the percentage distribution of items by age and content area specified in Math Objectives, 1985-86 Assessment, [NAEP, 1986a]). This is a near optimal weighting of the subscales in terms of the precision of the resulting composite and is optimal in terms of relative importance of the subscales implicit in the specifications of the Learning Area Committee. The definition of the composite in each grade/age is given in Table 10.10.

As described in section 10.1.4, certain of the linear indeterminacies in the subscales had been resolved by the anchoring of the subscale age means. However, this anchoring still leaves an indeterminacy in the subscales and in

Table 10.9

Estimated Correlations between Subscales
(Based on the First Plausible Value)

Grade 3/Age 9

	Measurement	N & O (H-L)	N & O (K & S)
Measurement	1.00	.63	.60
Numbers and Operations: Higher-level Applications	.63	1.00	.60
Numbers and Operations: Knowledge and Skills	.60	.60	1.00

Grade 7/Age 13

	Measurement	N & O (H-L)	N & O (K & S)	Geometry
Measurement	1.00	.73	.65	.64
Numbers and Operations: Higher-level Applications	.73	1.00	.64	.64
Numbers and Operations: Knowledge and Skills	.65	.64	1.00	.58
Geometry	.64	.64	.58	1.00

Grade 11/Age 17

	Measurement	N & O (H-L)	N & O (K & S)	Geometry	R & F
Measurement	1.00	.75	.64	.72	.69
Numbers and Operations: Higher-level Applications	.75	1.00	.68	.74	.74
Numbers and Operations: Knowledge and Skills	.64	.68	1.00	.63	.66
Geometry	.72	.74	.63	1.00	.73
Relations and Functions	.69	.74	.66	.73	1.00

Table 10.10

Defining Weights for the Mathematics Composite by Grade/Age

Subscale	Grade 3/ Age 9	Grade 7/ Age 13	Grade 11/ Age 17
Measurement	28	22	17
Geometry	0	11	14
Relations and Functions	0	0	17
Numbers and Operations--Higher-level Applications	36	33.5	26
Numbers and Operations--Knowledge and Skills	36	33.5	26
Total	100	100	100

the composite in that the means and standard deviations of the subscale-scores and hence the composite scores are still arbitrary. To resolve this ambiguity, the final step in the creation of the mathematics subscales and the composite scale was to linearly transform the intermediate composite scale so that the final composite would have a weighted mean of 250.5 and a weighted standard deviation of 50 across all students in the three grade/ages. The result is that the overall mathematics composite has the same mean and standard deviation as did the 1984 reading proficiency scale.

The same linear transformation which created the final composite was then applied to each of the intermediate mathematics subscales. Table 10.11 shows the coefficients of the (overall) linear transformations used to transform the subscales from their original units (on the 0-1 scale) to their final units.

Table 10.11

Coefficients of the Linear Transformations of the Subscales from their Original Units to the Units of the Composite

Subscale	Intercept	Slope
Measurement	255.40	51.69
Geometry	285.42	32.29
Relations and Functions	301.70	35.00
Numbers and Operations: Higher-level Applications	249.52	53.38
Numbers and Operations: Knowledge and Skills	256.14	54.20

The item parameters shown in Tables E.4 through E.15 of Appendix E and the conditioning effects shown in Tables B.4 through B.9 of Appendix B are in the metrics of the original calibration of the subscales. To represent these parameters and effects in terms of the metric of the final reporting subscales, the following transformations need to be performed. For a given subscale, let a_θ, b_θ and c_θ be the item parameters and Γ_θ the estimated conditioning effects, expressed in terms of the metric of the original calibration scale. Let α and β be the intercept and slope (from Table 10.11) of the linear transformation of the subscale proficiencies from their original (calibration) units to their final (reporting) units. Then, the transformation of a proficiency θ in original units to the metric of the reporting scale is $MP = \alpha + \beta\ \theta$. The corresponding transformations of the item parameters and estimated conditioning effects are

$$a_{MP} = a_\theta / \beta,$$

$$b_{MP} = \alpha + \beta\ b_\theta,$$

$$c_{MP} = c_\theta, \text{ and}$$

$$\Gamma_{MP} = \alpha + \beta\ \Gamma_\theta.$$

Within a grade/age group, the composite encompasses the subscales defined for that grade/age, weighted in accordance with the Learning Area Committee's specifications, and consequently provides an index of mathematics achievement applicable to that grade/age. However, since the number of subscales going into the composite differs by grade/age, there is the question of the comparability of the composite scale-scores across grade/ages. To justify the inclusion of additional subscales into the composite at the higher grade/ages, Table 10.12 shows a comparison of selected subgroup means for students in grades 7 and 11 for the mathematics composite as it is defined with the equivalent means based on a weighted average of the three age spanning subscales. This latter weighted mean uses weights proportional to the percentage distribution of items by age and for these three subscales as specified in Math Objectives, 1985-86 Assessment (NAEP, 1986a). (The mathematics composite is identical to this weighted mean for third grade students). It can be seen from the table that there are only trivial differences between the two composites in terms of their subgroup means, due to the high degree of correlation between the subscales (Table 10.9) and the fact that the age group means of each of the subscales have been anchored to the same points. Consequently, a composite based on all available subscales at a given grade/age retains the advantage of summarizing over all facets of mathematics defined for that grade/age while allowing meaningful comparisons between the grade/ages.

Finally, it is necessary to caution that, although the mathematics composite is expressed in apparently the same units as the 1984 reading proficiency scale in that both scales have the same means and standard deviations, it is not appropriate to compare scores on the mathematics composite with scores on the reading scale. The transformation chosen to resolve the linear indeterminacies in the mathematics composite is a convenient transformation, but is only one of a conceptually infinite number

Table 10.12

Comparison by Grade and Demographic Subgroups of the Mathematics Composite Mean with the Mean of the Three Age-Spanning Subscales

	Grade 7		Grade 11	
	Composite Mean	Mean of the Age-spanning Subscales *	Composite Mean	Mean of the Age-spanning Subscales
Total	267.1 (0.6)**	267.3 (0.6)	304.0 (0.7)	303.9 (0.7)
Male	266.6 (0.6)	266.6 (0.6)	306.1 (1.0)	306.5 (0.9)
Female	267.6 (0.7)	267.9 (0.7)	301.8 (0.8)	301.4 (0.8)
White	274.0 (0.6)	274.2 (0.7)	309.4 (0.7)	309.6 (0.6)
Black	245.4 (0.8)	245.1 (0.9)	279.2 (1.2)	278.6 (1.2)
Hispanic	251.3 (1.1)	251.0 (1.1)	285.6 (1.5)	285.2 (1.6)
Other	269.0 (7.2)	269.3 (6.9)	317.1 (6.4)	317.4 (6.0)
NE	275.3 (1.2)	275.4 (1.2)	309.6 (1.5)	309.0 (1.4)
SE	261.3 (1.3)	261.2 (1.2)	297.2 (1.1)	297.5 (1.0)
Central	270.6 (1.2)	270.8 (1.1)	305.6 (1.2)	305.9 (1.1)
West	262.8 (1.3)	263.0 (1.3)	302.3 (2.0)	302.4 (1.8)
ERural	265.6 (3.4)	265.8 (3.2)	299.0 (3.4)	300.1 (3.3)
LMet	246.4 (2.2)	246.2 (2.2)	279.9 (3.3)	279.2 (3.1)
HMet	281.9 (1.9)	282.4 (1.9)	320.9 (2.1)	320.3 (2.0)
<HS	249.4 (0.8)	249.5 (0.9)	284.5 (1.3)	285.0 (1.4)
Grad HS	260.5 (0.6)	260.4 (0.7)	293.8 (0.7)	294.4 (0.8)
>HS	275.0 (0.7)	275.5 (0.8)	306.6 (0.8)	306.6 (0.8)
Grad Col	278.5 (0.9)	278.8 (0.9)	316.0 (0.9)	315.5 (0.9)
Unknown	251.4 (1.0)	250.9 (1.1)	278.8 (1.2)	278.8 (1.6)
Public	265.6 (0.5)	265.7 (0.5)	302.7 (0.7)	302.9 (0.7)
Non-publ	279.8 (2.5)	280.1 (2.5)	315.8 (2.3)	314.6 (2.2)

* Weighted mean of the Measurement, Numbers and Operations: Higher-level Applications, and Numbers and Operations: Knowledge and Skills subscales with weights determined by the Math Objectives, 1985-86 Assessment (NAEP, 1986a).

** Standard errors presented in parentheses (the correlations between the composite mean and the mean of the age-spanning subscales exceeds .97).

of such transformations that could have been chosen, any one of which would have provided equivalent information about the relative standings of subgroups of the population in terms of their abilities in mathematics.

10.1.6 Anchoring the Points on the Mathematics Composite

One of NAEP's major goals has always been to describe what students know and can do and stimulate debate about whether those levels of performance are satisfactory. An additional benefit of scale-score methodology is that it provides for a criterion-referenced interpretation of levels on a continuum of proficiency. NAEP initiated the scale anchoring process for the 1984 reading proficiency scale and has applied a technique in the same spirit as that scale anchoring for the anchoring of the mathematics composite. In both cases, the levels 150, 200, 250, 300, and 350 on the scale were chosen as anchor points. Each level was defined by describing the types of mathematics or reading (as the case may be) questions that most students attaining that proficiency level would be able to perform successfully and each level was exemplified by typical benchmark items.

The difference between the anchoring of reading proficiency and the anchoring of the mathematics composite stems from the fact that the reading scale was based on a univariate IRT model while the mathematics composite is an average of a number of subscales. In the case of reading, the IRT model provided, through the item parameters, the probability of a correct response by a randomly selected pupil at any point on the proficiency scale. Since these probabilities are not directly available in the case of the mathematics composite, they are empirically determined by the proportion of the assessed population at any given level who answered the item correctly. More precisely, the probability of answering a particular item correctly, given that the student's proficiency is at the 300 level (for example), was estimated by the proportion of students answering the item correctly who also had composite proficiencies within 12.5 units of the target level (i.e. between 287.5 and 312.5 for the 300 level). To avoid problems of instability of the estimated probabilities for very small numbers of respondents to an item, the probability was not defined if fewer than 10 students at a given proficiency level responded to the item.

Apart from this difference in the estimation of probabilities, the anchoring of reading and mathematics proceeded in the same way. Details of the reading anchoring appear in Beaton (1987b).

In the scale-anchoring process for the mathematics composite, NAEP identified sets of items from the 1986 assessment that were good discriminators between proficiency levels. The guideline used to select such items was that students at any given level would have at least a 65 to 80 percent (but often higher) probability of success with these mathematics questions, while the students at the next lower level would have a much lower probability of success. The criterion used was that the difference in probabilities between adjacent levels should exceed 30 percent. Mathematics educators examined these empirically selected items sets and used their expert judgment to characterize each proficiency level, contrasting tasks at that level with those at the levels just above and below.

10.1.7 WARM Background Composites

In addition to the mathematics cognitive items, students at all three age/grade levels were asked questions about their coursework, their attitudes toward mathematics, and the type of instruction they had received. The weighted average response method (WARM) was used to construct sets of composite background variables based on background questions specific to mathematics that were included in the mathematics blocks. A general description of the WARM procedure as it was applied to the 1986 assessment appears in Chapter 8.

The questions comprising each of the mathematics WARM composites appear in Appendix C in Tables C.5, C.6 and C.7, for grades 3, 7, and 11 respectively. The mapping of the original responses to the questions to the scaled and oriented responses used for the WARM composites appears in Table C.8 of Appendix C.

10.2 SCALING OF THE TREND DATA

For the portion of the assessment designed to measure trends, students were administered previously assessed mathematics questions according to the procedures used in prior assessments. Only students eligible by age were sampled in this trend assessment. A total pool of 68 questions were given at age 9, 98 at age 13, and 94 at age 17, with each of the booklets accompanied by a paced audio recording of the questions as was done in the first three assessments of mathematics. The pool of items that was scaled consisted of all noncalculator items from the trend portion of the 1986 assessment which were also given in at least one of the 1977-78 and 1981-82 assessments of mathematics. Due to the sparsity of trend items within the individual subscales defined in section 10.1, a single scale was fit to these trend items. Because very few of the items were also given in the 1973-74 mathematics assessment (1 at age 9, 2 at age 13, 4 at age 17), the data from this assessment was not included in the scaling for trend. (See section 10.2.3, below, for the technique used to extrapolate 1973 results onto the trend scale.)

The sample sizes for the estimation of trend are as follows:

Table 10.13
Student Sample Sizes for Mathematics Trend Scaling

	1977-78	1981-82	1986
Age 9	14,752	12,038	6,932
Age 13	24,209	15,758	6,200
Age 17 (in-school)	26,756	16,319	3,868

The measurement of trends in mathematics achievement over time was based on a somewhat different sample from that used for the 1986 spiral assessment results. In contrast to the BIB-spiral administration, where students read items silently to themselves in timed blocks, the method of administration in previous NAEP mathematics assessments used tape recordings to read items and pace students through the session. Furthermore, the range of birthdates which defined 9-year-old and 13-year-old students was different in the BIB-spiral administration than in previous assessments. Bridge samples of pace-administered mathematics items were included in the 1986 assessment in order to enable comparisons with previous NAEP assessments. To adjust for the changes in age definition in the case of 9- and 13-year-old students, two separate bridge samples of tape-recorder-administered items were included in the assessment, one using the old age definitions and one the definitions used in the BIB-spiral administration. The scaling for trends was carried out using the bridge data from the 1986 assessment and data from the NAEP mathematics assessments in 1977-78 and 1981-82.

Consequently, the scaling for trend included 11 distinct samples of students, defined as follows:

Table 10.14
Samples of Students Used in the Scaling for Trend

Assessment	Age 9	Age 13	Age 17
1977-78	X	X	X
1981-82	X	X	X
1986 Bridge A	X	X	
1986 Bridge B	X	X	X

In the above, Bridge A refers to the tape-recorder-administered assessment of 9- and 13-year-olds using the old age definitions and time of assessment; Bridge B refers to the tape-recorder-administered assessment of 9-, 13-, and 17-year-olds using the new age definitions and time of assessment. (The Bridge B assessment of 17-year-olds actually uses the same age definitions and time of assessment as in previous assessments, since these were unchanged for 17-year-olds).

10.2.1 Estimation of Item Parameters and Generation of Plausible Values

As noted above, there were insufficient items per content area to support the creation of subscales. Accordingly, the scaling for trends in mathematics was accomplished by fitting a univariate IRT model to the set of trend items.

The first step in the scaling process was the estimation of item parameters for the trend items. This item calibration was performed separately for each of the three age groups, using data from the last three assessments. The calibration for each age used the BILOG program and was performed on a subsample of all the available subjects, resulting in approximately 550 examinees in each assessment year for each item. (Approximately 275 students from the Bridge A sample and 275 students from the Bridge B sample entered the calibration for each item).

A total of 56 items for age 9, 79 items for age 13, and 74 items for age 17 were initially calibrated. In the course of calibration, item fit was evaluated by inspecting residuals from the fitted item response curves. As a result of these examinations, two items were identified as displaying poor fit and dropped from the final scaling. One item (N266801) was dropped from the age 17 scaling because of poor fit for the 1981-82 sample and one item (N252601) was dropped from the age 9 scaling because of poor fit for both the 1981-82 and the 1986 samples. An additional item (N286102) was dropped from the age 9 scaling because of a change in presentation format which accompanied an outlying trend in percent correct across the assessment years.

The results of the item calibration phase were item parameters for 54 items for age 9, 79 items for age 13, and 74 items for age 17. Table 10.15 shows a breakdown of the items scaled by age, assessment year, and content category. A list of the items scaled for the three ages, along with their item parameters appears in Tables E.31 through E.33 in Appendix E.

The next step in the scaling of mathematics trend was the generation of plausible values for the trend scale. The estimation of plausible values was conducted independently by age for each of the assessment samples identified in Table 10.14. Because there were fewer background variables available for trend, there were fewer conditioning variables used in the creation of the plausible values. The conditioning variables and the estimated conditioning effects are given in Tables B.10 through B.20 in Appendix B for the three grade/age groups.

10.2.2 Linking to the Cross-sectional Mathematics Composite

The units of the final trend scale were determined linking each of the three age scales to the mathematics composite scale. This was done for each age by matching the mean and standard deviation of on the trend scale of the 1986 Bridge B sample (the sample with the new age definition) to the mean and standard deviation on the composite mathematics scale of the corresponding age sample. Table 10.16 shows the coefficients of the linear transformations used to transform the trend scale. A transformation analogous to that discusses in section 10.1.5 can be used to transform the item parameters presented in Appendix E and estimated conditioning effects presented in Appendix B from the original calibration metric to the final reporting metric.

Table 10.15
Counts of Mathematics Trend Items
by Age, Year, and Content Area

Year	Age	Fund. Meth	Data Org. & Int.	Meas.	Geom.	Rln., Func. & Alg.	N & O HL	N & O KS	Total
1977-78	9	4	8	7	1	2	3	11	36
	13	4	10	4	7	3	6	20	54
	17	5	6	6	10	9	9	16	61
1981-82	9	4	11	12	1	2	5	19	54
	13	4	10	13	7	3	12	29	78
	17	5	6	7	11	9	14	20	72
1986	9	4	11	12	1	2	5	19	54
	13	4	10	13	7	3	12	29	78
	17	5	6	7	11	10	14	20	73

Table 10.16
Coefficients of the Linear Transformation
of the Trend Scale from Original Units
to Units of the Composite

Age	Intercept	Slope
9	218.42	35.84
13	266.58	34.57
17	300.70	33.88

10.2.3 Extrapolation of the 1973-74 Mean P-value Results onto the Trend Scale

Because of insufficient items in common with the 1986 trend assessment, the 1973-74 mathematics assessment was not included in the scaling of NAEP trend data. However, for the nation and several reporting subgroups (e.g., male, female) at each of the three age levels, an estimate of the 1973-74 mean level of student mathematics proficiency was computed.

These estimates were obtained by assuming that the relationship within a given age level between the logit of a subgroup's mean p-value (i.e., mean proportion correct) and its respective mathematics proficiency mean was linear and that the same line held for all assessment years and for all subgroups within the age level. Under this assumption, the between-year difference of the mean proficiency values of a subgroup for a pair of assessment years is equal to a constant (B) times the between-year difference of the logits of the mean p-values of that subgroup for the same two years.

For each age level, a mean p-value estimate using a common set of items was available for 1973-74, 1977-78, and 1981-82. The constant B was estimated by a regression (through the origin) of the difference between proficiency means in 1977-78 and 1981-82 on the corresponding difference between the logits of the mean p-values for these two years. All subgroups in a given age were included in the regression. The estimate of the 1973-74 proficiency mean for a subgroup was then obtained as the sum of the 1977-78 subgroup mean proficiency and B times the difference between the logits of the 1973-74 and 1977-78 subgroup mean p-values.

The quality of this extrapolation technique was evaluated by comparing its performance in predicting the 1977-78 data. The actual values of the 1977-78 subgroup mean proficiencies were compared with the predicted values formed as the sum of the 1981-82 subgroup mean proficiency and B times the difference between the logits of the 1977-78 and 1981-82 subgroup mean p-values. The predictions were very close to the actual values, the residual means squared error being only .4 percent of the variance of the actual values.

CHAPTER 11

Science Data Analysis

Chapter 11

SCIENCE DATA ANALYSIS[1]

Kentaro Yamamoto

Educational Testing Service

The design for the analysis of the spiral and bridge sample data in the science assessment was similar to the one developed for the mathematics data (Chapter 10). The 1986 science assessment, reported in The Science Report Card: Elements of Risk and Recovery (Mullis & Jenkins, 1988), examined two different aspects of evaluating proficiency in science. One was the cross-sectional data analysis, undertaken to examine how subgroups of the population compare to each other across ages. The other was trend data analysis, which examined how 1986 student achievement compared to past assessments, hence permitting the examination of changes in science proficiency over time. This chapter describes the technical details of the item parameter estimation, and rescaling performed for the science cross-sectional and trend analyses. The underlying theory is discussed in Chapter 8.

11.1 CROSS-SECTIONAL DATA ANALYSIS

The design for the analysis of the spiral sample data in the science assessment involved three different grade/age groups. In addition, two bridge samples were used to link the trend data to the BIB data. All samples were multistage stratified random samples across the nation (see Chapter 3 for a discussion). Sample sizes are listed in the following table.

Table 11.1
Science Scale Item Information, by Sample

Sample	No. of Cases	No. of Items
Grade 3/Age 9, Spiral	11,575	124
Grade 3/Age 9, Bridge A	6,932	56
Grade 3/Age 9, Bridge B	4,042	56
Grade 7/Age 13, Spiral	11,171	194
Grade 7/Age 13, Bridge A	6,200	76
Grade 7/Age 13, Bridge B	4,178	76
Grade 11/Age 17, Spiral	20,535	244
Grade 11/Age 17, Bridge B	3,868	78

---

[1] David Freund, Bruce Kaplan, Maxine Kingston, Edward Kulick, Michael Narcowich, Jennifer Nelson, Alfred Rogers, and Minhwei Wang performed the data analysis. Robert Mislevy, Kathleen Sheehan, and Eugene Johnson provided consultation. Janet Johnson provided valuable editorial assistance.

11.1.1 Definition of Subscales

A total of 447 distinct science items were administered in the 1986 spiral assessment using a BIB-spiral design (Messick, Beaton, & Lord, 1983; Beaton, 1987a) to allocate the items to the sampled students (Chapter 3). Seven blocks of science questions were assessed at grade 3/age 9, 9 blocks at grade 7/age 13, and 11 blocks at grade 11/age 17. Two of the grade 7/age 13 blocks (numbers 5 and 6) were also used at grade 11/age 17. Out of 52 booklets prepared for grade 3/age 9, 30 contained one or more science blocks. Thirty-two of 68 booklets for grade 7/age 13 and 42 of 93 booklets for grade 11/age 17 contained at least one science block. Detailed arrangements of blocks and items contained in them are documented in chapter 4.

The pool of items used in the 1986 science assessment contained a range of open-ended and multiple-choice items. The framework for the development of the items was formulated by nationally representative panels of science specialists, educators, and concerned citizens and is documented in Science Objectives, 1985-1986 Assessment (NAEP, 1986b). The objectives were defined in three dimensions: content, context, and cognition. The content categories included:

1) life science;
2) physics;
3) chemistry;
4) earth and space science;
5) history of science; and
6) nature of science.

The context categories included:

1) scientific;
2) personal;
3) societal; and
4) technological.

The cognition categories included:

1) knows;
2) uses; and
3) integrates.

Science analyses were carried out along six subscales. Science subscales were designed to capture the essential subdivisions of science as indicated by the Science Learning Area Committee in order to allow the detection of potential differences in performance patterns between those subdivisions. The initial basis for the definition of the subscales comes from the three-dimensional framework defined by the Learning Area Committee. While this three-dimensional framework is meaningful and finely defines the subareas of interest to science educators, the number of items contained in each category was insufficient to scale categories with current technology.

As a result, only the content categories were used to create subscales. Physics and chemistry for grade 3/age 9 were combined and renamed physical science, a term that more aptly reflects the content of learning for that grade/age. Also, since there were only four items in the physical science subscale common to the other two grade/age levels, including them with the items administered to grade 7/age 13 and grade 11/age 17 would not have been appropriate. The history of science subscale was dropped because it had an insufficient number of items (25) to ensure accurate scaling. Earth and space science was dropped for grade 3/age 9 for two reasons: There were only 13 earth and space science items for grade 3/age 9, and there were only two items common to other grade/ages.

11.1.2 Estimation of Item Parameters for the Subscales

The computer program BILOG (Mislevy & Bock, 1982) was used to estimate the item parameters of the three parameter IRT model for the items in each subscale independently using roughly a one-fourth sample of the 1986 sample. Eight items were responded to by slightly fewer than 1,000 subjects; all other items were responded to by at least 1,000 subjects. The largest response size was over 3,000. (See Beaton, 1987a, for further description of the calibration process.)

Table 11.2 lists the names of the subscales and numbers of items for each subscale for each grade/age group after scaling. For various reasons described later in this chapter, some items were dropped from the data analysis. A total of 396 items was used to analyze the 1986 data; 384 were multiple-choice and 12 were open-ended. Among multiple-choice items, 66 had only two choices. Consequently these 66 items had low discrimination parameter values with high "guessing" parameter values (about .50). It should be noted that at the time of calibration, 14 items in the earth and space science subscale for grade 3/age 9 were included, but later 12 items given only to grade 3/age 9 were dropped. The inclusion of these 12 items had little impact on the calibration of remaining science items, because only two items were common to other grade/ages. Hence, a linkage of ability distribution of grade 3/age 9 to the other grade/ages is very weak.

Items were dropped from other subscales because of a lack of fit to the IRT model. Items that were dropped from the item pool often did not have monotone increasing empirical item characteristic curves. There were no specific characteristics that were common to these dropped items. Table 11.3 lists the items that are dropped because of lack of fit.

Table 11.2
Identification of Science Subscales and Number of Items Used for Analysis

Subscale	Total	Dropped	Number of Items: Grade 3/ Age 9	Number of Items: Grade 7/ Age 13	Number of Items: Grade 11/ Age 17
Life Science	116	(4)	39	44	59
Chemistry	55	(1)	--	23	44
Nature of Science	67	(4)	17	33	36
Physics	62	(2)	--	30	44
Earth and Space Science	52	(12)	--	42	39
Physical Science	44	(3)	44	--	--
History of Science	0	(25)	--	--	--
Total	396	(51)	100	172	222

Table 11.3
Science Items Dropped for Specified Populations Because of Lack of Fit to IRT

NAEP ID	Subscale Number	Subscale Name	Age Group Deleted	Age Group Remaining
400201	1	Life Science	9	13,17
401701	6	Physical Science	9	--
402004	6	Physical Science	9	--
402601	6	Physical Science	9	--
404903	3	Chemistry	13	--
407501	4	Physics	13	--
409401	3	Nature of Science	13	--
409402	3	Nature of Science	13	--
409403	3	Nature of Science	13	--
410002	1	Life Science	17	--
412901	5	Earth & Space Science	9	13
413301	3	Nature of Science	9,13	--
414001	1	Life Science	13	--
430101	1	Life Science	17	--
431501	4	Physics	17	--
437201	1	Life Science	17	--

Tables E.16 through E.28 in Appendix E show the estimated item parameters. These item parameter estimates are from the BILOG computer program prior to any rescaling. The unit and origin were set provisionally in each subscale calibration run by standardizing the distribution of the calibration sample of examinees. One, two, or three age groups were used to calibrate the item parameters depending upon the subscale (see Table 11.2). Therefore, item parameters in different subscales are not on the same metric, and are not directly comparable. Items in different subscales should not be recombined to form new subsets of items for any reason whatever without first recalibrating the item parameters for the set of items the user intends to group.

11.1.3 Generation of Multivariate Plausible Values for the Subscales and for Rescaling

Multivariate plausible values were generated using the M-GROUP computer program (Sheehan, 1985) according to the procedure described in Chapter 8. Initially each subscale was run separately to obtain subscale conditioning coefficients and error variances, then combined as the initial values for the multivariate case. At this point, it was decided to delete the earth and space science subscale for age 9; consequently, the multivariate M-GROUP was repeated in order to exclude this subgroup. The final conditioning coefficients and error variances are listed in Tables B.21 through B.26 of Appendix B. For the purpose of verification, the means and standard deviations of the multivariate plausible values were compared to the univariate calibrated ability distributions from the BILOG runs. Note that the calibrating sample is roughly a quarter of the total sample that was used for the multivariate plausible values; therefore, similar but not exact values were expected. The results are listed in Table 11.4.

In Table 11.4, the means and standard deviations of the plausible values for the physics subscale for grade 7/age 13 appear to be different from the values from the BILOG scale. In order to determine that this deviation is caused by the selection of the quarter-sample used for calibration, a more detailed posterior population distribution was estimated and was found to have a mean of -.32 and standard deviation of .85. This is much closer to the multivariate plausible value results than to the BILOG results. Therefore, this strongly indicated that the difference was due to sample variances rather than to the misfit of the measurement model.

Even though item parameters were estimated with the same standardization method so that the calibration sample of examinees have a mean of 0.0 and a standard deviation of 1.0, the differences in the age samples among subscales causes the estimated item parameters to be on different scales. Consequently the estimated abilities of students on all subscales have different origins and accompanying standard deviations. Since any linear transformation of the IRT theta scale retains all information, it is more convenient to have all subscales on a comparable scale. As with mathematics, rescaling was carried out in two steps. The first step was to put each subscale onto the same unit of measure as the others. The second step was to rescale the unit of measure itself so that the distribution of the three age groups combined had a weighted mean of 250.50 and a weighted standard deviation of 50.0.

The method applied to rescale science plausible values is essentially the same as the one used in mathematics. In science there are two subscales that span all three grade/ages, and an intermediate transformation was accomplished by matching the science age 9 and age 17 means on each subscale to the corresponding averages of the age group means between the two subscales. This produces two different means for age 13 on two of the

Table 11.4

Comparison of the Subscale Means and Standard Deviations Based on the Multivariate Plausible Values with the Univariate BILOG Results

Subscale	First Plausible Values Mean	First Plausible Values S.D.	BILOG Mean	BILOG S.D.
Grade 3/Age 9				
Life Science	-.69	.81	-.75	.79
Nature of Science	-.63	.91	-.63	.90
Physical Science	.08	1.07	.00	1.00
Grade 7/Age 13				
Life Science	.04	.82	.00	.80
Chemistry	-.43	.87	-.44	.80
Nature of Science	-.01	.76	-.06	.79
Physics	-.29	.89	-.40	.91
Earth & Space Science	-.16	.94	-.24	.91
Grade 11/Age 17				
Life Science	.80	.79	.75	.78
Chemistry	.50	1.02	.44	.99
Nature of Science	.75	.94	.69	.84
Physics	.39	.94	.40	.92
Earth & Space Science	.65	.91	.57	.93

subscales (life science, and nature of science). Chemistry, physics, and earth and space science all appeared at the two higher age groups. The age 17 mean was matched to the mean of the age 17 means across the two age spanning subscales, but the age 13 mean was matched to the mean transformed age 13 mean obtained from the two science subscales that spanned all three ages. Physical science appeared only at age 9 and this mean was set to the mean of the age 9 subscale means (again over the three age-spanning subscales) and the standard deviation was set to the geometric mean of the age 9 standard deviations. This method of scale determination constrains the age 9 mean to be equal across subscales and the age 17 means to be equal across subscales, but the age 13 means can be expected to vary slightly.

11.1.4 Creating the Composite Scale and Final Proficiency Scale

While multiple proficiency scales provide useful and very revealing information about the relative relationships among subpopulations, the desire to have a single index to summarize overall performance remains a high priority among policymakers and the public at large. For that reason, a science composite was defined as a weighted average of the results across subscales. Not all subscales apply to all ages nor does the importance associated with each subscale remain the same across all ages. Therefore, the weights assigned to compute the average of the estimated subscale proficiencies differ by grade/age. The weights were assigned proportional to the percentage distribution of items by age and content specified in Science Objectives, 1985-86 Assessment (NAEP, 1986b). This is a nearly optimal weighting procedure of the subscales in terms of the precision of the resulting composite. This procedure is also optimal in terms of retaining the relative importance of the subscales implicit in the specifications of the science Learning Area Committee. The definition of weights for the composite in each grade/age is given in Table 11.5.

Table 11.5
Defining Weights for the Science Composite
by Grade/Age

Subscale	Grade 3/Age 9	Grade 7/Age 13	Grade 11/Age 17
Life Science	47	27	26
Chemistry	0	17	26
Nature of Science	33	17	16
Physics	0	17	21
Earth & Space Science	0	22	16
Physical Science	20	0	0
Total	100	100	100

As described earlier, the linear indeterminacies among the subscales had been resolved by the anchoring of the subscale age means; that is, all the subscales are now on the same common scale. However, this still leaves the indeterminacy of the common scale itself. To resolve this ambiguity, the final step in the creation of the science scale was to linearly transform the intermediate composite scale so that the final composite would have a weighted mean of 250.5 and a weighted standard deviation of 50 across all students in the three ages. The result is that the overall science composite has the same mean and standard deviation as did the 1984 reading proficiency scale.

The same linear transformation that created the final composite was then applied to each of the intermediate science subscales. Table 11.6 shows the coefficients of the (overall) linear transformations used to transform the subscales from their original units (calibrating scale) to the final proficiency scale.

Table 11.6
Coefficients of the Linear Transformations
of the Subscales from the Calibrating Scale
to the Units of the Reporting Proficiency Scale

Subscale	Intercept	Slope
Life Science	244.20	52.18
Chemistry	264.57	44.34
Nature of Science	243.63	56.55
Physics	263.12	60.27
Earth & Space Science	253.07	50.63
Physical Science	203.82	43.57

Item parameters on the calibrating scale may be transformed using the above intercepts and slopes so that conditional probability of correct response given a proficiency scale can be obtained. They are: a(proficiency)=a(calibrated)/slope, b(proficiency)=slope*b(calibrated), and c parameters remain unchanged.

Finally, it is necessary to caution that, although the science composite is seemingly expressed in the same units as the 1984 reading scale and the 1986 mathematics scale, it is not appropriate to compare scores on the science composite with scores on the other subject area scales. The transformation chosen to resolve the linear indeterminacies in the science composite is a convenient transformation, but is only one of a conceptually infinite number of such transformations that could have been chosen, any one of which would have provided equivalent information about the relative standings of subgroups of the population in terms of their abilities in science. There was no link, real or implied, in the construction of the science composite and the science subscales to mathematics or to reading.

11.1.5 Anchoring the Points on the Science Composite

Behavioral anchoring was devised to associate descriptive statements of a student's ability with a level on a continuum of proficiency. This was done successfully with the 1984 reading scale and the 1986 mathematics scale. The same technique was applied to the science composite. As with the other subject areas, five levels--150, 200, 250, 300, and 350--were selected on the scale and chosen as anchor points. Each level was defined by a description of the types of questions that most students attaining that proficiency level would be able to answer correctly while most students at least one level lower would answer incorrectly. In this way each level was exemplified by typical benchmark items that describe a subset of abilities indicative of that level of proficiency.

There was no difference in the anchoring procedures used for science or mathematics; both subjects used composite proficiency scores that were derived from multivariate subscale proficiencies. For that reason the empirical proportion correct was used for science as well as mathematics in place of the IRT-driven theoretical conditional probabilities. The empirical proportion correct was calculated by selecting subjects in a range in which we were interested and these responses were averaged. The ranges were set as within 12.5 units of the anchoring levels. For example, students who scored between 287.5 and 312.5, and also were administered a particular item, were used to estimate the conditional probability of the correct response on that item. To avoid problems of instability of the estimated probabilities for very small numbers of respondents to an item, the probability was not defined if fewer than 10 students at a given proficiency level responded to the item. For the details of behavioral anchoring, see Beaton (1987b).

In the scale-anchoring process for the science composite, NAEP identified sets of items from the 1986 assessment that were good discriminators between proficiency levels. The guideline used to select such items was that students at any given level would have at least a 65 to 80 percent (but often higher) probability of success with these science questions, while the students at the next lower level would have a much lower probability of success. The criterion used was that the difference in probabilities between adjacent levels should exceed 30 percent. Science educators examined these sets of empirically selected items and used their expert judgment to characterize each proficiency level, contrasting tasks at that level with those at the levels just above and below.

11.1.6 WARM Background Composites

In a fashion identical to that used for the mathematics assessment, students at all three grade/age levels were asked questions about their coursework, their attitudes toward science, and the type of instruction they had received, in addition to science cognitive items. The weighted average response method (WARM) was used to construct sets of composite background variables based on background questions specific to science that were included in the science blocks. A general description of the WARM procedure as it was applied to the 1986 assessment appears in Chapter 8. The questions comprising each of the science WARM composites appear in Appendix C in Tables C.9, C.10, and C.11 for grades 3, 7, and 11 respectively. The matrix used to map the original responses to the scaled and oriented responses used for the WARM composites appears in Table C.12.

11.2 SCALING OF THE TREND DATA

To maintain continuity with the past data, sample age definition, the mode of delivery of items, and time of assessment for trend data were different from cross-sectional data. The trend data comprised subsamples defined by age only (9-, 13-, and 17-year-olds), while the cross-sectional data included students in the appropriate grades as well as ages for all three subsamples. There were three booklets used to measure trend for ages 9 and 13. Each booklet contained a reading, a mathematics, and a science block. Each student took one of these booklets. The mathematics and science parts of the booklets were presented aurally using a tape recorder as in the past assessments. The tape recorder was turned off for the reading block. There were two booklets used to measure trend for age 17. Each booklet covered mathematics and science. These booklets were presented aurally to the students (see Chapter 4). There was a total of 63 items in the science trend item pool for age 9 administered to a total of 6,932 students; a total of 83 items for age 13 administered to a total of 6,200 students; and, a total of 82 items for age 17 administered to a total of 3,868 students. The science trend item pool consisted of items that were given in at least one previous assessment. The trend item pool was a subset of the cross-sectional item pool.

The trend data analysis examined data from three points in time, namely the 1976-77, 1981-82, and 1986 assessments. Due to the sparsity of trend items within the subscales defined in section 11.2, a single scale was fit to these trend items. Too few common items between the 1973-74 and 1986 science assessments prohibited the inclusion of the 1973-74 data in the trend analysis.

Three differences between trend data and cross-sectional data make them incomparable to each other without equating. These differences are mode of administration, age definition of the sample, and time of testing. The bridge sample provides equating information by preserving the same mode of administration and age definition of the sample as the past trend data, and the same time of testing as the cross-sectional data. To align the trend to the cross-sectional, age only students were selected from the cross-sectional sample to provide comparable samples of students under the two modes of administration. There is now a link between the trend sample and the cross-sectional sample through the bridge sample, and the age-only subsample of cross-sectional students.

The following table shows 11 distinct samples of students used for the scaling for trend:

Table 11.7
Samples of Students Used in Scaling for Trend

Assessment	Age 9	Age 13	Age 17
1976-77	x	x	x
1981-82	x	x	x
1986 Bridge A	x	x	
1986 Bridge B	x	x	x

In the above, Bridge A refers to the tape-recorder-administered assessment of 9- and 13-year-olds using the old age definitions and time of assessment; Bridge B refers to the tape-recorder-administered assessment of 9- and 13-year-olds using the new age definitions and time of assessment. For 17-year-olds, the Bridge B age definition and time of assessment are identical to those used in past assessments; that is, for age 17, Bridge A is identical to Bridge B.

11.2.1 Estimation of Item Parameters and Generation of Plausible Values

As noted above, trend data analysis was carried out on a single scale. The majority of items given to age 13 students were also given to age 17 students. Therefore, the age 13 and age 17 samples were combined and item parameters were estimated. Since there was only one item given in common to ages 9, 13 and 17, and there were no items in common between ages 9 and 13 or ages 9 and 17, the item parameters for the age 9 sample were estimated separately. The following table shows the number of items in common across the three ages.

Table 11.8
Number of Items in Common Across the Three Ages

	Age 9	Age 13	Age 17	All Ages
Age 9	82	0	0	
Age 13		33	42	
Age 17			35	
All Ages				1

The above table excludes items that did not fit to the IRT model in either cross-sectional or trend data analysis. There were 3, 1, and 3 items dropped from scaling for ages 9, 13 and 17, respectively. Twenty-four items that were given in 1976-77 and 1981-82 but not in 1986 were added to the item pool for age 9. The fact that there were so few items given in the 1981-82 special assessment would have made the scaling of the 1981-82 sample very difficult without increasing the number of items. Prior to adding 24 items, there were only ten science items common to the age 9 assessments across the three assessments. A list of the items scaled for the three ages, along with their item parameters appears in Tables E.34, E.35, and E.36 in Appendix E.

The estimation of plausible values was conducted independently by age for each assessment sample identified in Table 11.7. Because there were fewer background variables available for trend in the past, there were fewer conditioning variables used in the creation of the plausible values. The conditioning variables and the estimated conditioning effects are given in Tables B.27 through B.37 of Appendix B for the three grade/age groups.

11.2.2 Linking to the Cross-sectional Science Composite

The units of the final trend scale were determined by linking each of the three age scales to the science composite scale. This was done for each age by matching the mean and standard deviation of the trend scale of the 1986 Bridge B sample (the sample with the new age definition) to the mean and standard deviation on the composite science scale of the corresponding age sample. Table 11.9 shows the coefficients of the linear transformations used to transform the trend scale. Note that the transformation coefficients are identical for ages 13 and 17. (See Appendix D for a detailed discussion.)

Table 11.9

Coefficients of the Linear Transformation
of the Trend Scale from the Calibration Units
to the Units of the Composite

Age	Intercept	Slope
9	221.73	42.43
13	269.33	44.67
17	269.33	44.67

11.2.3 Extrapolation of the 1971-72 and 1973-74 Mean P-Values Results onto the Trend Scale

Because of insufficient common items between the 1971-72, 1973-74, and 1986 science assessments, data from 1971-72 and 1973-74 were not included in the IRT trend analysis. However, for the nation and several reporting subgroups (e.g., gender) at each of the three age levels, an estimate of the 1971-72 and 1973-74 mean level of student mathematics proficiency was computed and is discussed in this report.

The method used to derive 1971-72 and 1973-74 science proficiency scores is based on the strong linear relationship between the logit of a subgroup's weighted mean proportion correct and its respective proficiency mean across the assessments of 1976-77, 1981-82, and 1986, given an age level. Assuming this linear relationship would hold for both 1971-72 and 1973-74 data, extrapolation of proficiency scores of subgroups can be obtained from weighted mean proportion correct of corresponding subgroups of those years. For each age, separate linear coefficients between proficiency scores and difference in logits of weighted mean proportion correct were obtained. Common items for each pair of the three assessment years 1976-77, 1981-82, and 1986, as well as common items for all three years, were used to calculate weighted mean proportion correct. These coefficients per age were kept constant to estimate proficiency scores of 1971-72 and 1973-74 from differences in the logits of the weighted mean percent correct of the corresponding year.

All subgroups in a given age were included in the regression. The estimate of the 1973-74 proficiency mean for a subgroup was then obtained as the sum of the 1976-77 mean proficiency of the subgroup and the coefficient times the difference between the logit of the 1973-74 and 1976-77 subgroup mean proportion correct. Insufficient common items between 1971-72 and 1976-77 made it difficult to extrapolate 1971-72 proficiency scores from 1976-77 scores. For that reason, the estimates of 1971-72 proficiency mean were calculated in a fashion similar to that done for 1973-74, except that 1976-77 proficiency scores were replaced by 1973-74 extrapolated proficiency scores.

CHAPTER 12

Computer Competence Data Analysis

Chapter 12

COMPUTER COMPETENCE DATA ANALYSIS

Nancy A. Mead

Educational Testing Service

The National Assessment of Educational Progress assessed the computer competence of students at three grade and age levels in the spring of 1986. The levels were grade 3/age 9, grade 7/age 13, and grade 11/age 17. This was the first time that computer competence had been assessed by NAEP. The areas covered by the assessment included knowledge of computer concepts, familiarity with various computer applications, and skills in computer programming.

Initial analysis plans for computer competence did not call for scaling the results. Instead, plans were made to compute mean percents-correct across narrowly defined collections of items and to relate these results to background variables. It was felt that scaling was not appropriate for the computer competence because the items tapped a wide range of skills that have no underlying pedagogical or psychological continuum. For example, 11th graders may demonstrate less understanding than 7th graders; within a grade students may understand some computer applications and not others or may have textbook knowledge of computers and not user knowledge (or the converse).

A group of consultants were asked to assist NAEP staff in developing a data analysis plan and in interpreting the results. Two members of the group were selected from the Learning Area Committee that guided item development and three individuals provided new perspectives. The group included a curriculum developer, a teacher trainer and researcher, a school district computer science coordinator, a content area teacher who used computer applications in the classroom, and a writer who specialized in computer-related topics.

The first meeting was devoted to determining the specifications for the data analysis. The analysis group reviewed the items in the pool, their classification according to the computer competence objectives, and their unweighted percents-correct. Many items were very difficult for students. Often the percentage of correct responses fell close to the chance level. As an initial analysis step, the group recommended that item analyses be conducted and that items that did not discriminate between high and low achievers be eliminated. The group also recommended that two items be eliminated from the analysis. One of these questions did not have a clear correct answer and the other had a printing error.

The analysis group reviewed the knowledge items and proposed that they be reported by two categories: textbook knowledge and practical knowledge. The first category deals with concepts usually presented in textbooks, for example, the history of computers or terminology. The second category deals with knowledge that could be gained through use of a computer.

The analysis group classified the application items into five categories: distinguishing between applications, word processing, databases, graphics, and spreadsheets. The first category of items asked simple questions about what application programs should be used to accomplish various tasks. The other categories focused on specific applications. Later, when the group reviewed the results, they decided that the first category did not warrant separate reporting and these items were reassigned to the appropriate application categories. The computer competence objectives encompassed several additional applications: laboratory instrumentation, telecommunication, music generation, and models and simulations. However, the analysis group felt that there were not enough items in these areas to warrant reporting.

The analysis group decided that the programming items should be reported by programming language: BASIC, Logo, and Pascal. Within Pascal, two types of items were identified: generic and specific. Students might be able to answer items in the first category if they had a knowledge of a programming language other than Pascal. The second category of items required knowledge of language structures specific to Pascal.

The analysis group also identified student background variables that should be used in the analyses. These included general demographic characteristics as well as factors that were specific to students' experience with computers. A few additional variables were added by NAEP staff. The final list of general variables included:

- student sex
- student race or ethnic background
- student age
- parents' level of education
- region of the country
- size and type of community
- type of school (public or private)
- student's high school program (general, academic or vocational--grade 11/age 17 only)

The computer related variables included:

- Has the student ever used a computer?
- Does the student's family own a computer?
- Is the student studying computers in school now? (grade 3/age 9 and grade 7/age 13 only)
- Is the student using computers to practice math, reading or spelling? (grade3/age 9 and grade 7/age 13 only)
- Is the student currently taking a class in computers? (grade 11/age 17 only)

- Has the student taken a computer literacy class? (grade 11/age 17 only)
- Has the student taken a computer programming class? (grade 11/age 17 only)

The group also wanted to look at the programming language means in relation to the variables "Which programming languages does the student know?" and "Which programming language does the student know best?"

In addition to the variables listed above, the analysis group wanted to develop a composite variable that indicated various levels of exposure to computers. After considering several approaches, the group settled on a variable that crossed "Does the student's family own a computer?" and "Is the student studying computers in school now?" (or, at grade 11/age 17, "Is the student currently taking a class in computers?"). Four different categories of exposure were created:

1) student's family has a computer and student is studying computers;
2) student's family has a computer and student is not studying computers;
3) student's family doesn't have a computer and student is studying computers; and
4) student's family doesn't have a computer and student is not studying computers.

As anticipated, the highest and lowest levels of exposure were associated with the highest and lowest levels of computer competence.

Item analyses were conducted for all items. Even though many items were difficult, all items discriminated between high and low achievers.

Analyses were then conducted for all students in grades 3, 7, and 11 and for all subgroups defined by the background variables. Weighted percents-correct were computed for each item. Finally, weighted mean percents-correct were computed across all items and across all categories of items identified by the analysis group.

Percents-correct and mean percents-correct were computed according to the formula:

$$\frac{\text{Rights}}{\text{Rights + Wrongs + Omits}}$$

Students who did not reach an item were excluded from the analyses. The percentages of students who did not reach an item was no greater than 5 percent except for some items in the BASIC and Logo sections for the 3rd graders and for some items in the Logo section for the 7th graders. Means that included any items with a not reached greater than 5 percent were flagged with a warning: "Less than 95 percent of the population reflected in the mean."

A small number of the computer competence items were open-ended. Students provided responses in the form of lines of computer code or brief written explanations. These responses were rated by professional scorers. To document the consistency of scorers, a 20 percent sample of the items were independently rated by a second scorer. (See Chapter 6.2 for a description of professional scoring and scorer reliability.)

At their second meeting the analysis group reviewed the results and offered their interpretations of findings. The observations of the group were incorporated into the assessment report.

CHAPTER 13

History and Literature Data Analysis

Chapter 13

HISTORY AND LITERATURE DATA ANALYSIS[1]

Rebecca Zwick

Educational Testing Service

History and literature items were included in four of the 92 booklets administered to 9,774 students who were 17 years old or in grade 11 in the 1986 assessment. These items were administered for the first time in the 1986 assessment. Each of the four booklets contained one of four history blocks (H1, H2, H3, or H4), one of four literature blocks (L1, L2, L3, or L4), and reading block R4. (That is, the history and literature blocks were not BIB-spiralled.) The history blocks consisted of 34 to 36 cognitive items and a common set of 25 history background and attitude items; the literature blocks contained 30 to 31 cognitive items, as well as 42 literature background and attitude items. All history and literature items were multiple choice.

13.1 ITEM ANALYSIS AND DIMENSIONALITY ASSESSMENT

Within each of the two subject areas, the four blocks were constructed to be similar in content and difficulty. Table 13.1 shows the number of items, KR-20 reliability, average tetrachoric, mean, standard deviation, and mean percent correct for each block. Within each content area, the item analysis results are quite similar across blocks, although the history blocks differed somewhat in difficulty.

A series of analyses of differential item functioning (see Holland & Thayer, 1986) on the history and literature items was also performed. (The analyses of history items are detailed in Zwick & Ercikan, in press.) The purpose of these analyses was to identify items on which there were performance differences across racial/ethnic and gender groups who were matched on overall score (and in some cases, on exposure to relevant instruction). After examining the results of the analyses, it was determined that removal of the items that showed differential functioning would seriously impair the validity of the test. For example, all three history items showing substantial differential performance in the White student-Black student comparison were items on Black history, on which Black students performed better than a matched group of White students. Removal of Black history items, however, would clearly be undesirable.

---

[1] Laurel Barnett and David Freund provided statistical programming. Robert Mislevy and Kathleen Sheehan provided consultation on scaling. David Freund prepared the documentation of history and literature derived variables contained in Table F.1 of Appendix F.

Table 13.1

NAEP History and Literature Assessment

Descriptive Statistics*

Block	Numbers of Items	KR-20 Reliability	Average Tetrachoric	Mean Number Correct	S.D.	Mean Percent Correct
H1	36	.84	.39	20.8	6.3	.58
H2	36	.83	.35	19.2	6.4	.53
H3	35	.82	.40	16.9	6.1	.48
H4	34	.87	.48	19.2	6.9	.57
L1	30	.78	.35	15.1	5.2	.51
L2	31	.76	.30	15.6	4.9	.50
L3	30	.77	.30	16.4	4.9	.55
L4	30	.72	.24	15.7	4.5	.52

---

*Sample size for each analysis is approximately 1950.

For purposes of dimensionality assessment in NAEP, we have investigated the full-information factor analysis method developed by Bock, Gibbons, and Muraki (1985; see Zwick, 1987a), which provides an elegant model for assessing the dimensionality of dichotomous item responses. Unfortunately, the implementation of the full-information solution in the TESTFACT program (Wilson, Wood, & Gibbons, 1983) is expensive and sometimes results in convergence problems. Furthermore, there is some evidence that heavy reliance on the significance tests provided can lead to over-factoring. At present, therefore, we have chosen to use a less elegant, but apparently satisfactory procedure: Through a nonstandard application of the TESTFACT program, it is possible to perform a MINRES (Harman, 1976) factor analysis of a matrix of tetrachoric correlations that have been corrected for guessing using a modification of Carroll's (1945) correction.

The results of an analysis of this kind are shown in Table 13.2. In each of the eight blocks, a large first factor was in evidence; the size of the second factor ranged from 6 to 13 percent of the first in history and from 16 to 21 percent of the first in literature. Careful examination of the items loading on the second factors, both before and after rotation, revealed no content-based interpretation for these factors. For comparison, results of a similar analysis of NAEP reading items is shown. (This analysis, conducted in 1984, is not strictly parallel with the present analyses in that 42 items intended to represent four distinct types of reading items were selected from a larger pool for inclusion.) As in the case of the reading items, the decision was made that the history and literature data could be well summarized by a single history scale and a single literature scale.

13.2 SCALING

As in the case of reading, mathematics, and science, item response theory (IRT) methods were used to derive a history scale and a literature scale based on the cognitive items. Scale values were obtained for only the 7,812 students who were in grade 11; scale values were not obtained for 17-year-olds who were in grades other than 11.

The scaling of history and literature differed in two ways from the IRT scaling approach used in other NAEP subject areas. First, because the history and literature assessment consisted of four nonoverlapping sets of items in each of the two subject areas, it was necessary to make the assumption that the four blocks of items within a subject area were equivalent samples of the content domain. This assumption is reasonable since the blocks were constructed to be similar in content, and was supported by the item analysis results in Table 13.1. The second difference is that, because of the relatively large number of items administered to each student, background data were not used to improve the estimation of students' proficiency distributions. That is, there were no conditioning variables (see Chapter 8).

Scaling was achieved through a straightforward application of the BILOG program (Mislevy & Bock, 1982). Within each content area, a posterior distribution was estimated for each student, based on that student's observed

Table 13.2
Results of MINRES Factor Analyses of Guessing-Corrected Tetrachoric Matrices of NAEP Items*

			Percent of Explained Variance	
		Number of Items	First Factor	Second Factor
1984 Reading (Grade 8/Age 13)		42**	29	4
NAEP 1986 History and Literature (Grade 11)				
1986 History (Grade 11)	Block			
	H1	36	40	5
	H2	36	38	5
	H3	35	42	5
	H4	34	51	3
1986 Literature (Grade 11)	Block			
	L1	30	38	6
	L2	31	36	7
	L3	30	33	7
	L4	30	38	6

---

*Sample size for each analysis is approximately 1950.

**Items were chosen to represent four distinct item types.

item responses and on the estimated grade 11 population distribution. The mean of the posterior distribution was then taken as the proficiency estimate for that student in the provisional θ metric. That is,

$$\hat{\theta}_i = E(\theta|\underset{\sim}{x}_i) = \int \theta p(\theta|\underset{\sim}{x}_i,\underset{\sim}{a},\underset{\sim}{b},\underset{\sim}{c})d\theta$$

$$= \int \theta p(\underset{\sim}{x}_i|\theta,\underset{\sim}{a},\underset{\sim}{b},\underset{\sim}{c})g(\theta)d\theta \Big/ \int p(\underset{\sim}{x}_i|\theta,\underset{\sim}{a},\underset{\sim}{b},\underset{\sim}{c})g(\theta)d\theta,$$

where

$\hat{\theta}_i$	is the proficiency estimate for the i^{th} examinee,
$\underset{\sim}{x}_i$	is the vector of item responses for the i^{th} examinee,
$\underset{\sim}{a}$, $\underset{\sim}{b}$, and $\underset{\sim}{c}$	are the vectors of item parameters for the three-parameter logistic model, and
$g(\theta)$	is the (estimated) distribution of proficiency in the nation.

This distribution was approximated as a histogram over 20 equally spaced points from -5 to +5 in the manner described in Mislevy (1984). For reporting purposes, the estimated proficiencies were transformed so that, for both history and literature, the grade 11 mean and standard deviation were 285 and 40, respectively.

Item parameter estimates for the history and literature items are given in Appendix E in the original BILOG calibration metric. In order to obtain results in terms of the proficiency scales used for reporting (i.e., means of 285, standard deviations of 40), the scale values that would be obtained using the parameter estimates in Appendix E need to be transformed. The relation between the provisional scales from BILOG (θH and θL for history and literature, respectively) and the final reporting scales (RSH and RSL) are

$$RSH = 43.60\ (\theta H) + 285.08 \text{ and}$$
$$RSL = 45.36\ (\theta L) + 285.02.$$

The corresponding changes to the item parameter estimates are $a_{RSH} = a_{\theta H}/43.60$, $b_{RSH} = 43.60\ b_{\theta H} + 285.08$ and $a_{RSL} = a_{\theta L}/45.36$, $b_{RSL} = 45.36 b_{\theta L} + 285.02$. The c parameters are the same in both metrics (i.e., $c_{RSH} = c_{\theta H}$ and $c_{RSL} = c_{\theta L}$).

13.3 ANALYSES USING BACKGROUND VARIABLES

The NAEP report Literature and U.S. History (Applebee, Langer, & Mullis, 1987) includes analyses based on variables derived from the responses to the background and attitude questions contained in the history and literature blocks. The definitions of these variables are given in Table F.1 of Appendix F.

13.4 ANALYSES USING MEAN PERCENTS-CORRECT

The Literature and U.S. History report also contained analysis based on mean percent correct for sets of items in certain categories. The items included in each of these analyses are listed in Table F.2 of Appendix F.

CHAPTER 14

Weighting Procedures and Variance Estimation

Chapter 14

WEIGHTING PROCEDURES AND VARIANCE ESTIMATION[1]

Eugene G. Johnson

Educational Testing Service

John Burke, Jill Braden, Morris H. Hansen,
Josefina A. Lago, and Benjamin J. Tepping

Westat, Inc.

As was the case in previous assessments, the 1986 National Assessment used a complex sample design with the goal to obtain a sample from which estimates of population and subpopulation characteristics could be obtained with reasonably high precision (as measured by low sampling variability). At the same time, it was necessary that the sample be economically and operationally feasible to obtain. The resulting sample had certain properties that had to be taken into account in the proper analysis of the data from the assessment.

The 1986 NAEP sample was obtained through a stratified multistage probability sampling design that included provisions for sampling certain subpopulations at higher rates (see Chapter 3). To account for the differential probabilities of selection, each student was assigned a sampling weight. Section 14.1, below, will discuss the procedures used to derive these sampling weights.

Another consequence of the NAEP sample design is its effect on the estimation of sampling variability. Because of the effects of cluster selection (students within schools, schools within primary sampling units) and because of the effects of certain adjustments to the sampling weights (nonresponse and poststratification), observations made on different students cannot be assumed to be independent of one another. As a result, ordinary formulae for the estimation of the variance of sample statistics, based on assumptions of independence, will tend to underestimate the true sampling variability. Section 14.2 will discuss the jackknifing technique used by NAEP to estimate sampling variability.

Since the sample design determines the derivation of the sampling weights and the estimation of sampling variability, it will be helpful to note the key features of the 1986 NAEP sample design. More detailed descriptions of the design appear in Chapter 3 of this report and in National Assessment of Educational Progress--17th Year Sampling and Weighting

---

[1] The tables of design effects were produced by David Freund.

Procedures Final Report (Burke, Braden, Hansen, Lago, & Tepping, 1987), the final report prepared by Westat, Inc., the firm subcontracted by ETS to select the sample.

The target population in 1986 consisted of 9-year-olds, 13-year-olds, and 17-year-olds enrolled in public and private elementary and secondary schools, along with other students in the modal grade for each of these three ages as these ages were defined. The 1986 sample was a multistage probability sample consisting of four stages of selection. The first stage of selection, the primary sampling units (PSUs), consisted of counties or groups of counties. The second stage of selection consisted of elementary and secondary schools. The assignment of sessions to sampled schools comprised the third stage of sampling, and the fourth stage involved the selection of students within schools and their assignment to sessions. The probabilities of selection of the first- and second-stage sampling units were proportional to measures of their size, while the probability for subsequent stages of selection were such that the overall probabilities of selection of students were approximately uniform, with exceptions for certain subpopulations that were oversampled by design. Students from schools with relatively high concentrations of Black, Hispanic, or Asian American students were deliberately sampled at twice the normal rate to obtain larger samples of respondents from those subpopulations in order to increase the precision in the estimation of the characteristics of these subpopulations. Students from schools with smaller numbers of eligibles received lower probabilities of selection.

A major change in the 1986 assessment from prior assessments was a shift to spring assessment for each age class, coupled with a change in the age definitions for the 9- and 13-year-old students. In previous assessments, 13-year-olds were defined on a calendar-year basis and were assessed in the fall; 9-year-olds were also defined on a calendar-year basis and were assessed in the winter; and 17-year-olds were defined on an October-through-September basis and assessed in the spring. For the spiral (main) assessment in 1986, the students of each of the three age classes were defined as the students born between October 1 and September 30 of the appropriate years. All ages were assessed in the spring for the spiral assessment of 1986. To determine the possible effects of changes in age definitions and time of assessment as well as the effects of change in mode of administration (elimination of the audiotape used for pacing the exercises), two bridge studies were also conducted.

The full 1986 NAEP assessment thus includes a number of different samples from several populations. Each of these samples has its own set of weights that are to be used to produce estimates about the characteristics of the population addressed by the sample (the target population). The various samples and their target populations are as follows:

The Spiral Samples of Students. These samples, one for each of the three grade/age combinations, were drawn in the spring, use the new age definitions, and consist of all students assessed in the main (spiral) assessment. The target population for each of these samples consists of all students who are in the specified grade/age combination who were deemed assessable by their school.

The Bridge A Samples of Students. For each of the ages 9 and 13, there are three bridge samples (from booklets 1, 2 and 3) designed to allow the measurement of the effect of changing the age definitions and the time of year the assessment data were collected. (Since these changes affected only ages 9 and 13, a bridge sample was not necessary for age 17. Since trend data have been traditionally collected only by age, grade sampling was unnecessary.) These samples were drawn at the old times of assessment and use the old age definitions. The target population for each of these samples consists of the assessable age eligibles, using the old age definitions.

The Bridge B Samples of Students. For each of the three ages (9, 13, and 17) there are two bridge samples (from booklets 4 and 5) designed to allow the measurement of the effect of changing from tape-recorded to printed mode of administration for mathematics and science. These samples were drawn in the spring and use the new age definitions. The target population for each of these samples consists of all students who are of the specified age, using the new age definitions.

14.1 DERIVATION OF THE SAMPLE WEIGHTS

As indicated previously, NAEP uses differential sampling rates, deliberately oversampling certain subpopulations to obtain larger samples of respondents from those subgroups thereby enhancing the precision of estimates of characteristics of these oversampled subgroups. As a result of this oversampling, these subpopulations, corresponding to students from schools with high concentrations of Black or Hispanic students, are overrepresented in the sample. Appropriate estimation of population characteristics must take this disproportionate representation into account. This is accomplished by assigning a weight to each respondent, where the weights properly account for the sample design and reflect the appropriate proportional representation of the various types of individuals in the population.

The weighting procedures for 1986 included computing the student's base weight, the reciprocal of the probability that the student was invited to a particular session. These base weights were then adjusted for nonresponse and then subjected to a trimming algorithm to reduce excessively large weights. The weights were further adjusted by a poststratification procedure in an effort to reduce the sampling error and certain potential biases of estimates relating to student populations corresponding to several subgroups of the total population. Poststratification was performed by adjusting the weights of the sampled students so that the resulting estimates of the total number of students in a number of specified subgroups of the population corresponded to population totals based on information from the Current Population Survey, the 1980 Census, and from NAEP. The subpopulations were defined in terms of race, ethnicity, Office of Business Economics region, and sampling descriptor of community (based on the size and degree of urbanization of a county).

The following sections provides an overview of the procedures used to derive the sampling weights. Further details in the derivation of these weights can be found in Burke et al. (1987).

14.1.1 Student Base Weight

The base weight assigned to a student is the reciprocal of the probability that the student was invited to a particular type of assessment session, that is, a spiral session or a particular bridge assessment session. That probability is the product of four factors

1) the probability that the PSU was selected;
2) the conditional probability, given the PSU, that the school was selected;
3) the conditional probability, given the sample of schools in a PSU, that the school was allocated the specified type of session; and
4) the conditional probability, given the school, that the student was invited to the specified type of session

Thus, the base weight for a student may be expressed as the product

$$W_B = PSUWT * SCHWT * SESSWT * STUDWT$$

where PSUWT, SCHWT, SESSWT, and STUDWT are, respectively, the reciprocals of the preceding probabilities.

14.1.2 Adjustment of Base Weights for Nonresponse

The base weight for a student was adjusted by three nonresponse factors: one to adjust for noncooperating schools, the second to adjust for allocated sessions that were not conducted, and the third to adjust for students who were invited to the assessment but did not appear either in the scheduled session or in a makeup session. Thus, the student nonresponse adjusted weight is of the form

$$W_w = W_B * f_1 * f_2 * f_3$$

where W_B is the student base weight, f_1 is a school nonresponse factor, f_2 is a session nonresponse factor, and f_3 is a student nonresponse factor, each computed as described below.

14.1.2.1 School Nonresponse Adjustment

School nonresponse adjustments were intended to compensate for school nonresponse occurring prior to spiral and tape session assignment. These factors were computed separately within each PSU for up to three classes of schools using as many nonresponse classes as the number of sampled schools in the PSU and nonresponse pattern allowed. In most cases, only one class was identified in the PSU for each of the three age groups.

For any nonresponse class, c, the school nonresponse factor for schools selected for spring assessment (either spiral or Bridge B) is given by

$$f_{1c} = \frac{\sum_{i \epsilon A} W_i G_i}{\sum_{i \epsilon B} W_i G_i}$$

where

W_i = school weight (the reciprocal of the probability of selection of the school conditional on the PSU);

G_i = estimated number of grade and age eligible students in school i;

set A consists of the original sample of eligible schools (including refusing schools but not including substitutes); and

set B consists of all cooperating schools at the time of session allocation (including schools that were substituted for noncooperating schools).

Note that, for a substitute school, W_i (SCHWT) was defined as the school weight of the originally selected school for which it was a substitute. The sampling rate of students within a substititute school (and hence the value of STUDWT for such a school) was defined using enrollment data for the substitute itself.

A similar formula was used for the school level nonresponse adjustment for the Bridge A schools with the exception that, since only age-eligible students were selected in the Bridge A samples, the factor G_i is replaced by A_i, the number of age-eligible students in the school.

14.1.2.2 Session Nonresponse Adjustment

The session nonresponse adjustments were intended to compensate for school nonresponse occurring after spiral and/or tape session assignment in the spring-selected schools. (No session nonresponse adjustment was needed for Bridge A schools since those schools were allocated tape sessions only. For those schools, session nonresponse is equivalent to school nonresponse and is adjusted for as in section 14.1.2.1.)

For spiral sessions, the adjustment was computed separately by PSU for one or two classes of schools in each of the three grade/age groups and is a ratio of the form

$$f_{2c} = \frac{\sum_{i \epsilon A} W^*_i G_i}{\sum_{i \epsilon B} W^*_i G_i}$$

where G_i is the number of grade/age eligibles as before, W^*_i is the product of the school-nonresponse adjusted school weight and the session weight (i.e. f_{1c} * SCHWT * SESSWT), the set A consists of all spiral-allocated schools in the nonresponse class c within the PSU who were cooperating at the time of spiral session allocation, and the set B consists of all such schools who ultimately cooperated.

For the Bridge B tape sessions, the adjustment was computed separately in each PSU for each of the two tape booklets in each of the three age groups and was of similar form to f_{2c}, above, with two exceptions. First, the factor G_i was replaced by A_i, the number of age eligibles in the school. Second, the sets A and B were restricted to those schools in the PSU who were allocated the particular tape booklet.

14.1.2.3 Student Nonresponse Adjustment

The student nonresponse adjustment was computed separately within a PSU by age group for each of the two tape booklets in Bridge B sessions and for each of the three tape booklets in Bridge A sessions. For tape booklet t in PSU h, the student nonresponse adjustment f_3 was computed as the ratio of the sum of the weights of all students in the PSU who were invited to a tape booklet t session divided by the sum of the weights of all students in the PSU who actually participated in a tape booklet t session; where the student weights were adjusted for school- and session-nonresponse.

For spiral sessions, the student nonresponse adjustment was made separately within each PSU for two sets of students: those in or above the grade modal for their age and those in a grade below that modal for their age, and is the ratio of the sum of the (school- and session-nonresponse adjusted) weights of all students in the given age set who were invited to a spiral session divided by the sum of the adjusted weights of all such students who actually participated. The use of two age sets for nonresponse adjustment is in recognition of the likely differences between students in the two sets both in their assessed abilities and in their likelihood of nonresponse.

14.1.3 Trimming of Weights

In a number of cases, students were assigned extremely large weights. One cause of large weights was underestimation of the number of eligible students in some schools leading to inappropriately low probabilities of selection for those schools. Other extremely large weights arose as the result of high levels of nonresponse coupled with low to moderate probabilities of selection.

Students with extremely large weights have an unusually large impact on estimates such as weighted means. Since the variability in weights contributes to the variance of an overall estimate by an approximate factor $1 + V^2$, where V^2 is the relative variance of the weights, a few extremely large weights are likely to produce large sampling variances of the statistics of interest, especially when the large weights are associated with students with atypical performance characteristics.

To reduce this problem, a procedure of trimming the more extreme weights to values somewhat closer to the mean weight was applied. This trimming can increase the accuracy of the resulting survey estimates, substantially reducing V^2 and hence the sampling variance while introducing a small bias. The trimming algorithm was identical to that used in the 1984 NAEP and had the effect, approximately, of trimming the weight of any school that contributed more than a specified proportion, ζ, to the estimated variance of the estimated number of students eligible for assessment. The trimming was done separately for the spiral assessment and for each tape booklet in each of the bridge samples. In each case, the value of the proportion ζ was chosen to be 10/M, where M was the number of schools in which a specified assessment was conducted. The number of schools whose weights were trimmed was small, being between 0 and 5 in each of the samples.

14.1.4 Poststratification

As in most sample surveys, the respondent weights are random variables that are subject to sampling variability. Even if there were no nonresponse, the respondent weights would at best provide unbiased estimates of the various subgroup proportions. However, since unbiasedness refers to average performance over a conceptually infinite number of replications of the sampling, it is unlikely that any given estimate, based on the achieved sample, will exactly equal the population value. Furthermore, the respondent weights have been adjusted for nonresponse and a number of extreme weights have been reduced in size.

To reduce the mean squared error of estimates using the sampling weights, these weights were further adjusted so that estimated population totals for a number of specified subgroups of the population, based on the sum of weights of students of the specified type, were the same as presumably better estimates derived from other sources. This adjustment, called poststratification, especially reduces the mean squared error of estimates relating to student populations that span several subgroups of the population. The poststratification was done separately for the spiral sessions and each of the bridge sessions within each grade/age group, because each of these can be viewed as separate samples of the appropriate population.

For the spiral assessment, 13 subgroups were defined in terms of race, ethnicity, Office of Business Economics region and community size (SDOC) as shown in Table 14.1. Each of the 13 subgroups was further divided into three classes:

1) students eligible by both age and grade;
2) students eligible by age only;
3) students eligible by grade only.

This resulted in 39 poststratification cells for each age class. The final weight for a student is the product of the base weight (as adjusted for nonresponse and after trimming) and a poststratification factor whose denominator is the sum of those weights for the cell to which the student belongs and whose numerator is an adjusted estimate, based on more reliable data, of the total number of students in the cell.

The adjusted estimate of the total number of students in a given cell is a composite of estimates from the 1986 NAEP sample and independent estimates based on projections based on 1983 and 1984 Current Population Survey estimates and 1985 Census projections. The adjusted estimate is a weighted mean of the various estimates, the weights being inversely proportional to the approximate relative variances of the NAEP and these independent estimates. (Further details are provided in Burke et al., 1987).

The sample of students in each of the tape assessments was much smaller than the sample for the spiral assessments. Consequently, some subgroups were collapsed for poststratification as follows:

1, 2
3
4
5
6, 7
8, 9
10, 11, 12
13

Furthermore, there was no subdivision into eligibility classes, so that there were eight poststratification cells for each age class. For the Bridge assessments, the numerators of the poststratification factors for these cells were the corresponding adjusted estimates used for computing the spiral poststratification factor. For each of the tape assessments in Bridge A and Bridge B, the denominators were the sums of the weights for each age class.

14.1.5 The Final Student-Weight: The Full-Sample Weight

The final weight assigned to a student is the student full-sample weight. This weight is the student's base weight after the application of the various adjustments described above. The student full-sample weight was used to derive all estimates of population and subpopulation characteristics that have been presented in the various NAEP reports, including simple estimates such as the proportion of students of a specified type who would respond in a certain way to an exercise and more complex estimates such as mean proficiency levels.

Table 14.1

Major Subgroups for Poststratification

Subgroup	Race	Ethnicity	Region	SDOC*
1	White	Non-Hispanic	NE	1, 2
2	White	Non-Hispanic	NE	3, 4, 5
3	White	Non-Hispanic	SE, Central	1, 2
4	White	Non-Hispanic	SE, Central	3
5	White	Non-Hispanic	SE, Central	4, 5
6	White	Non-Hispanic	West	1, 2
7	White	Non-Hispanic	West	3, 4, 5
8	Any	Hispanic	NE,SE,Central	Any
9	Any	Hispanic	West	Any
10	Black	Non-Hispanic	NE	Any
11	Black	Non-Hispanic	SE	Any
12	Black	Non-Hispanic	Central, West	Any
13	Other	Non-Hispanic	Any	Any

*SDOC (Sample Description of Community) categories: 1--Big City; 2--Fringe of Big City; 3--Medium City; 4--Small Place; and 5--Extreme Rural. The definition of the categories is based on county level 1980 Population Census data.

14.1.6 Other Weights

In addition to the weights for the assessed students, weights were also derived for excluded students and for the students whose teachers participated in the Teacher Survey.

Excluded students are those students who were unable to complete the assessment because of being non-English speaking, educable mentally retarded, or functionally disabled. Weights for excluded students were computed separately for the students excluded from any of the sessions in the spring assessment (the spiral and Bridge B samples combined) and for the students excluded from the Bridge A assessments (separately for the age 9 and the age 13 samples). As in the case of the weights for the assessed students, the excluded student weights were based on the probability of selection with adjustments for nonresponse and trimming of excessively large weights. Further details on the derivation of the excluded student weights can be found in Burke et al. (1987).

In every spiral-allocated school, a subsample of non-excluded students selected for spiral assessment was taken. For each subsampled student enrolled in a course in the learning area randomly assigned to the school, the teacher of that course was identified and asked to complete the teacher questionnaire. The responses of the teacher to that questionnaire are tied to the student to enable the estimation of the number or percent of students in the population whose teachers have certain characteristics. These estimates used the teacher/student weights, which are based on the final student weights of those spiral-assessed students who are linked to a completed teacher questionnaire. The teacher/student weight is the nonresponse-adjusted student weight further adjusted for the probability that the student's teacher was selected as well as for nonresponse on the part of the teachers. Additionally, the teacher/student weights were subjected to the trimming algorithm and poststratification adjustments. Further details on the construction of these weights appears in Burke et al. (1987).

Finally, in addition to these weights, which were used to derive all estimates of population and subpopulation characteristics, other sets of weights, called jackknife replicate weights, were derived to facilitate the estimation of sampling variability by the jackknife variance estimation technique. These weights and the jackknife estimator are discussed in the next section.

14.2 PROCEDURES USED BY NAEP TO ESTIMATE SAMPLING VARIABILITY

A major source of uncertainty in the estimation of the value in the population of a variable of interest exists because information about the variable is obtained on only a sample from the population. To reflect this fact, it is important to attach to any statistic (e.g., a mean) an estimate of the sampling variability to be expected for that statistic. Estimates of sampling variability provide information about how much the value of a given statistic would be likely to change if the statistic had been based on another, equivalent, sample of individuals drawn in exactly the same manner as the achieved sample. Consequently, the estimation of the sampling variability of any statistic must take into account the sample design.

As we have noted before, the NAEP sample is obtained via a stratified multistage probability sampling design that includes provisions for sampling certain subpopulations at higher rates. Additional characteristics of the sample include adjustments for both nonresponse and poststratification. The resulting sample has different statistical characteristics from those of a simple random sample. In particular, because of the effects of cluster selection (students within schools, schools within PSUs) and because of effects of nonresponse and poststratification adjustments, observations made on different students cannot be assumed to be independent of each other (and are, in fact, generally positively correlated). Furthermore, to account for the differential probabilities of selection (and the various adjustments), each student has an associated sampling weight, which must be used in the computation of any statistic and which is itself subject to sampling variability. Treatment of the data as a simple random sample, with disregard for the special characteristics of the NAEP sample design, will produce underestimates of the true sampling variability.

14.2.1 Estimation of the Sampling Variance of any Statistic by the Jackknife

This section describes how the sampling variability of statistics based on the NAEP data was estimated. (The estimation of variability due to imperfect measurement, a component of the overall variance of NAEP scale-scores, is discussed in section 8.4).

The jackknife procedure has a number of properties that make it particularly suited for the analysis of NAEP data:

1) It approximately estimates the sampling error arising from the complex sample selection and estimation procedures used in NAEP.

2) It reflects the component of sampling error introduced by the use of weighting factors that are dependent upon the sample data actually obtained.

3) It can be adapted readily to the estimation of sampling errors for parameters estimated using statistical modeling procedures, as well as for tabulation estimates such as totals and means.

4) Once appropriate weights are derived and attached to each record, jackknifing is straightforward to use for estimating sampling errors. A single set of replicate weights is required for all tabulations and model parameter estimates that may be needed.

The method of applying the jackknife procedure involves first defining groups of pairs of first-stage sampling units. For the 1986 NAEP spiral assessment, Westat defined 38 groups of such first-stage unit pairs, where pairing was performed so that the populations represented by each member of the pair were similar. In the definition and pairing of groups of first-stage units, a distinction was made between the eight largest certainty PSUs, the 26 smaller certainty PSUs, and the 60 noncertainty PSUs. The noncertainty PSUs were formed into 30 pairs. The pairs were formed on the basis of a number of characteristics of the strata from which they were selected, these being the change in population between the 1970 and 1980 population censuses, the proportions of the 1980 population who were Black or Hispanic and proportions of urban and farm populations. PSUs from similar strata were paired so as to minimize the bias of variance estimation (which reflects the between-stratum variance within these pairs, even though this does not contribute to the true sampling error). The 30 pairs were then combined into 15 groups of pairs, two pairs per group. This combining of pairs reduced the task of jackknife variance estimation to a more manageable level, while not adding bias to the variance estimation. The 26 smaller certainty PSUs were paired on the basis of the same criteria used to pair the strata of noncertainty PSUs, plus the level of educational expenditure per student. Each of the eight largest certainty PSUs constituted at least one jackknife pair in itself, each member of the pair consisting of schools within the PSU.

The end result was 38 jackknife pairs of first-stage units. Similar pairings were defined for the bridge assessments. For the Bridge A assessment, there are 33 pairs; there are also 33 pairs for the Bridge B assessment, but these correspond to somewhat different clusters of first-stage units. Further information on the construction of jackknife pairs can be found in Burke et al.(1987).

The component of the sampling variability attributable to the sampling of the portion of the population represented by a jackknife pair is estimated as the squared difference between the value of the statistic for the complete sample and a replicate estimate formed by recomputing the statistic on a specially constructed pseudoreplicate. This pseudoreplicate is created from the original dataset by eliminating one member of the jackknife pair and replacing it with a copy of the data from the complementary member of the jackknife pair. For computational purposes, the pseudoreplicate associated with a given pair is the original dataset with a different set of weights, referred to as the student replicate weights. We shall denote these replicate weights as SRWT01 through SRWT38, where SRWTi is formed by making the above adjustment with the i^{th} jackknife pair. This set of weight allows measurement of the total effect of replacing one member of the jackknife pair with a copy of the other, including adjustments for nonresponse and poststratification. The replicate estimate associated with the i^{th} pseudoreplicate for a given statistic is obtained by recalculating the statistic using the weights SRWTi instead of the student full-sample weights.

The student replicate weight, SRWTi, for the i^{th} pseudoreplicate was computed as follows:

Let W_B be the base weight of a student, where the base weight accounts for the probabilities of selection but does not include nonresponse or poststratification adjustments.

Then $\text{SRWTi} = f_i^{PS} \, W_{Bi}$

where

$$W_{Bi} = \begin{cases} 0 & \text{if the student is in the first set of first-stage units in jackknife pair } i \\ JF * f^{NR} * W_B & \text{if the student is in the second set of first-stage units in jackknife pair } i \\ f^{NR} * W_B & \text{if the student is in neither of the first-stage units in jackknife pair } i \end{cases}$$

is the replicate base weight formed by replacing the second member of the pair by the first, JF is a constant multiplier (usually equal to 2) designed to maintain certain population totals, f_i^{PS} is the poststratification adjustment factor based on these replicated base weights, and f^{NR} denotes the nonresponse adjustment factor appropriate for the student. These replicate weights allow the estimation both of the effect of poststratification, and, except for the case of the 8 largest certainty PSUs, the effect of the nonresponse adjustments. The nonresponse adjustments are taken into account implicitly because they were performed within the 76 jackknife pair halves, except in the case of the 8 certainty PSUs, where adjustments were made within PSU, but across the two pair halves.

As a specific example of the use of the student replicate weights, let $t(\underline{y},\underline{w})$ be any statistic that is a function of the sample responses $\underline{y}$ and the weights $\underline{w}$ and that estimates population value T. For example, t could be a weighted mean, a weighted percent-correct point or a weighted regression coefficient. The $t(\underline{y},\underline{w})$, computed with the sampling weights (WEIGHT on the data tapes) is the appropriate sample estimate of T. To compute Vâr(t), the sampling variance for this statistic, proceed in the following manner:

1) For each of the 38 pairs of first-stage units, compute the associated pseudoreplicate for the statistic. For the i^{th} pair, this is

   $$t_i = t(\underline{y}, \underline{\text{SRWT}}\text{i})$$

   which is the statistic t recalculated by using SRWTi instead of the sampling weights.

2) The sample variance of t is

$$\hat{\mathrm{Var}}(t) = \sum_{i=1}^{38} (t_i - t)^2 \quad .$$

This estimation technique is called the multiweight jackknife approach and was used by NAEP to estimate all sampling errors presented in the various reports. A similar procedure was followed to estimate the sampling variability for statistics based on any of the bridge samples. The only difference was in the number of jackknife pairs (and hence replicate weights) used.

A further discussion of the variance estimation procedure used by ETS including a discussion of alternative jackknife estimators that were also considered appears in Johnson (1987a).

14.2.2 The Degrees of Freedom of the Variance Estimate

Note that the jackknife procedure estimates the sampling variability of the statistic by assessing the effect of change in the sample at the level of clusters of first-stage units. For this reason, the number of degrees of freedom of the variance estimate $\hat{\mathrm{Var}}(t)$ will be at most equal to the number of pairs. The number of degrees of freedom, which is indicative of the variability of the variance estimate, equals the number of independent pieces of information used to generate the variance estimates. In the current case, for the spiral sample, the pieces of information are the 38 squared differences $(t_i - t)^2$, which are approximately independent, each supplying at most one degree of freedom, regardless of how many individuals were sampled within any PSU. (There are fewer squared differences with the bridge samples.) In fact, as shown in Johnson (1988), there can be considerably fewer than 38 degrees of freedom attributable to jackknife variance estimate for the NAEP sample.

14.2.3 Approximating the Sampling Variance Using Design Effects

The major computational load in computing uncertainty measures for any statistic exists in the computation of the uncertainty due to sampling variability. As noted in section 14.2.1, the jackknife estimate of the variability of a statistic based on one or more observed NAEP variables in the 1986 spiral sample requires computing the statistic 39 times. Because the cost of the full procedure may well prove prohibitive in many studies, an approximate procedure that can produce reasonable approximations at lower costs is provided in this section.

As indicated in section 14.2.1, it is inappropriate to estimate the sampling variability of any statistic based on the NAEP database by using simple random sampling (SRS) formulas. These formulas, which are the ones used by most standard statistical software such as SPSS and SAS, will produce variance estimates that are generally much smaller than is warranted by the sample design.

It may be possible to account approximately for the effects of the sample design by using an inflation factor, the design effect, developed by Kish (1965) and extended by Kish and Frankel (1974). The design effect for a statistic is the ratio of the actual variance of the statistic (taking the sample design into account) to the conventional variance estimate based on the same number of elements. To avoid sources of bias due to improper representation, this conventional estimate must use the sampling weights. The design effect may be used to adjust error estimates based on simple random sampling assumptions to account approximately for the effect of the design. In practice, this is often accomplished by dividing the total sample size by the design effect and using this effective sample size in the computation of errors. Note that the value of the design effect depends on the type of statistic computed and the variables considered in a particular analysis as well as the clustering effects occurring among sampled elements.

Further discussions on the derivation and characteristics of design effects can be found in Kish (1965), Kish and Frankel (1974), and in Johnson (1987b).

As an example of the distribution of design effects to be expected from the 1986 NAEP data, we consider the design effect for the key statistic, P, the estimated proportion of a specified subgroup of the population who would correctly respond to a given assessment exercise. This estimate, which is a weighted mean of the responses of individuals in the subgroup to the exercise (where an individual's response is either 0 or 1), has a design effect of the form

$$\mathrm{deff}(P) = \mathrm{Var}_{JK}(P)/(P(1 - P)/N) \quad .$$

In the above, N is the total number of individuals in the subgroup responding to the exercise, $\mathrm{Var}_{JK}(P)$ is the jackknife variance of P, and $P(1 - P)/N$ is the conventional variance estimate of P. (The estimate $P(1 - P)/N$ has the same form as the simple random sampling estimator of the variance of P. In fact, the sample weights have been taken into account via the weighted estimation of P.)

The distributions of design effects for proportions correct by grade and by demographic subgroup within grade across all cognitive reading items presented in the 1986 spiral assessment are indicated in Tables 14.2 through 14.4.

Table 14.2 addresses the distributions of the design effects for the 63 multiple-choice cognitive reading exercises presented in 1986 to grade 3 students. These distributions are shown for the population as a whole ("total") as well as for a variety of demographic subgroups: sex; race/ethnicity (White, Black, Hispanic, other); age (less than modal age, modal age, greater than modal age); region (Northeast, Southeast, Central, West); Size and Type of Community (Rural, Low Metropolitan, High

Table 14.2

Distribution of Design Effects by Demographic Subgroup for the Cognitive Reading Items Given in 1986

Grade 3*

Group	LoQ	Median	HiQ	Max	Mean
TOTAL	1.40	1.73	2.06	3.15	1.75
MALE	1.38	1.63	2.01	2.94	1.73
FEMALE	1.18	1.37	1.72	2.69	1.49
WHITE	1.24	1.48	1.91	3.01	1.59
BLACK	1.10	1.38	1.70	3.22	1.47
HISPANIC	1.06	1.38	1.59	2.32	1.37
OTHER	1.76	2.04	3.23	8.57	2.56
< AGE	1.16	1.46	1.71	2.63	1.47
= AGE	1.33	1.70	1.94	3.08	1.73
> AGE	1.28	1.59	1.91	2.95	1.62
NE	0.94	1.34	2.00	4.79	1.66
SE	0.84	1.36	1.96	3.36	1.47
CENTRAL	1.05	1.34	2.00	4.70	1.53
WEST	1.19	2.12	2.81	5.75	2.16
RURAL	1.08	1.63	1.94	5.02	1.69
LOW MET	1.04	1.40	1.77	3.22	1.45
HI MET	1.10	1.35	1.64	2.91	1.42
BIG CITY	1.15	1.52	2.07	4.04	1.65
FRINGE	1.02	1.37	1.54	4.09	1.42
MED CITY	1.12	1.69	2.37	4.18	1.77
SMALL PL	1.16	1.51	2.14	3.49	1.70
< H.S.	1.09	1.36	1.59	2.30	1.36
GRAD HS	1.05	1.41	1.73	2.91	1.45
POST HS	1.02	1.23	1.73	2.61	1.39
GRAD COL	1.02	1.21	1.46	2.61	1.29
UNKNOWN	1.41	1.57	1.92	3.50	1.68

* Distributions based on 63 multiple-choice items

Table 14.3

Distribution of Design Effects
by Demographic Subgroup
for the Cognitive Reading Items Given in 1986

Grade 7*

Group	LoQ	Median	HiQ	Max	Mean
TOTAL	1.22	1.51	1.80	3.42	1.56
MALE	1.21	1.49	1.73	3.39	1.58
FEMALE	1.06	1.32	1.48	2.33	1.31
WHITE	1.12	1.40	1.72	3.54	1.46
BLACK	1.17	1.47	1.64	2.68	1.43
HISPANIC	1.19	1.57	1.92	2.96	1.60
OTHER	1.21	1.75	2.28	11.15	2.01
< AGE	1.07	1.27	1.50	2.32	1.31
= AGE	1.14	1.36	1.31	3.25	1.47
> AGE	1.19	1.34	1.56	2.94	1.40
NE	0.84	1.22	1.73	2.87	1.33
SE	0.92	1.21	1.58	2.67	1.26
CENTRAL	0.80	1.52	2.20	5.26	1.70
WEST	1.10	1.44	2.30	5.80	1.74
RURAL	1.07	1.62	2.23	3.81	1.67
LOW MET	1.19	1.54	1.99	4.54	1.65
HI MET	1.02	1.30	1.60	2.45	1.34
BIG CITY	1.19	1.48	1.84	2.66	1.51
FRINGE	1.17	1.40	1.78	3.93	1.56
MED CITY	1.04	1.34	1.83	3.95	1.47
SMALL PL	0.94	1.14	1.77	3.77	1.39
< H.S.	1.20	1.46	1.86	3.12	1.55
GRAD HS	1.22	1.45	1.84	3.42	1.53
POST HS	0.94	1.18	1.48	2.37	1.27
GRAD HS	1.12	1.33	1.59	2.62	1.35
UNKNOWN	1.14	1.33	1.62	2.61	1.42

* Distribution based on 65 multiple-choice items

Table 14.4

Distribution of Design Effects by Demographic Subgroup for the Cognitive Reading Items Given in 1986

Grade 11*

Group	LoQ	Median	HiQ	Max	Mean
TOTAL	1.35	1.68	2.07	3.82	1.78
MALE	1.22	1.59	1.99	3.50	1.71
FEMALE	1.09	1.31	1.70	3.05	1.44
WHITE	1.28	1.57	1.97	4.32	1.76
BLACK	1.02	1.23	1.62	2.77	1.37
HISPANIC	1.17	1.35	1.58	2.18	1.37
OTHER	0.99	1.37	1.91	3.20	1.47
< AGE	1.06	1.27	1.54	2.85	1.30
= AGE	1.18	1.62	1.98	3.41	1.67
> AGE	1.14	1.33	1.61	2.49	1.39
NE	1.04	1.55	2.17	5.99	1.83
SE	0.76	1.36	1.83	3.33	1.40
CENTRAL	1.07	1.71	2.55	6.13	2.05
WEST	1.05	1.29	2.12	5.47	1.67
RURAL	0.85	1.48	1.93	4.62	1.58
LOW MET	1.14	1.46	1.90	4.94	1.65
HI MET	1.03	1.26	1.76	2.66	1.38
BIG CITY	0.97	1.21	1.74	4.45	1.45
FRINGE	0.83	1.29	1.69	3.28	1.41
MED CITY	1.16	1.50	2.18	4.17	1.74
SMALL PL	1.13	1.57	1.92	3.85	1.61
< H.S.	1.17	1.33	1.60	3.09	1.44
GRAD HS	1.12	1.35	1.60	2.86	1.41
POST HS	1.02	1.26	1.64	2.66	1.41
GRAD COL	1.24	1.58	1.97	3.77	1.69
UNKNOWN	1.03	1.17	1.39	2.07	1.23

* Distributions based on 65 multiple-choice items

Metropolitan, Big City, Urban Fringe, Medium City, Small Place); and parental education (At Most High School, Graduated High School, Post-High School, Graduated College, Unknown). For each of these groupings of grade 3 students, Table 14.2 provides the lower quartile (LoQ), median, upper quartile (HiQ) and maximum design effect as well as the mean design effect.

Equivalent information on the distributions of design effects for the 65 multiple-choice cognitive reading exercises presented to grade 7 students appears as Table 14.3. The 65 multiple-choice cognitive reading items presented to grade 11 students are addressed by Table 14.4.

The particular demographic variables shown (sex, race/ethnicity, age, region, parental education, and size and type of community) were selected because (1) they are major variables in NAEP reports and (2) they reflect different types of divisions of the population that might have different levels of sampling variability.

The tables and figures show that the design effects are predominantly larger than 1, indicating that standard variance estimation formulas will be generally too small, sometimes markedly so. Although the distributions of design effects appear somewhat different for certain subgroups of the population, they are, perhaps, similar enough (at least within a grade) to select an overall composite value that is adequate for most purposes. In choosing a composite design effect, some consideration must be made about the relative consequences of overestimating the variance as opposed to underestimating the variance. For example, adopting the position that an overestimate of the variance is as severe an error as an underestimate leads to using a composite that is near to the center of the distributions of the design effects. Possible composites of this type are the mean and median design effects. In the current data, the mean design effects are 1.8, 1.6 and 1.8 for the total populations in grades 3, 7 and 11, respectively. These are close to, but greater than, the median design effects: 1.7, 1.5 and 1.7.

Alternatively, one can adopt the position that it is a graver error to underestimate the variability of a statistic than to overestimate it. For example, Johnson and King (1987) examine estimation of variances using design effects (among other techniques) under assumption that the consequences of an underestimate are three times as severe as those of an overestimate of the same magnitude. Assuming that the distribution of design effects is roughly independent of the jackknife variance, so that the size of a design effect does not depend on the size of the variance, and adopting a loss function that is a weighted sum of absolute values of the deviations of predicted from actual with underestimates receiving three times the weight of overestimates, produces the upper quartile of the design effects as the composite value. The values of this composite, for the total populations in grades 3, 7, and 11, respectively, are 2.1, 1.8, and 2.1.

PART III

CHAPTER 15

Statistical Summary of the 1986 NAEP and Estimates of the Proficiency of American Students

Chapter 15

STATISTICAL SUMMARY OF THE 1986 NAEP SAMPLE AND ESTIMATES OF THE PROFICIENCIES OF AMERICAN STUDENTS

Albert E. Beaton, David S. Freund,
Bruce A. Kaplan, and Michael A. Narcowich

Educational Testing Service

This chapter presents a statistical summary of the NAEP 1986 sample and some selected results from the assessment.

This technical report so far has dealt primarily with the design of the 1986 National Assessment and the processes and procedures that were used in collecting and analyzing the data. Chapter 2 provides an overview of the 1986 NAEP design and summarizes how the students were selected, how they were assessed, and how their responses moved from assessment sessions to a carefully constructed database, ready for analysis. Chapter 7 summarizes the methods of data analysis, including scaling and parameter estimation. This chapter will assume a general familiarity with the structure of NAEP as summarized in those chapters.

In this chapter, three of the many types of NAEP results are presented:

- results of the instrument development process, including the sizes of the items pools and numbers of booklets;
- results of the sampling process, including the numbers of students in each sample by selected subgroups; and
- results of the parameter estimation process, including estimates of the proficiencies of several populations of students in reading, mathematics, and science.

This is a technical report and is not intended to be interpretive. Estimates are presented, but no attempt is made to explain or evaluate the students' performance. Interpretive results are presented in NAEP reports such as Who Reads Best? (Applebee, Langer, & Mullis, 1988) and The Mathematics Report Card: Are We Measuring Up? (Dossey, Mullis, Lindquist, & Chambers, 1988). We will leave it to experts in the educational process to hypothesize why the results occurred. The public-use data tapes and user guide (Rogers, Kline, Norris, Johnson, Mislevy, Zwick, Barone, & Kaplan, 1988) are available for those who wish to estimate other parameters of student performance from the NAEP data or to search for possible explanations for the population characteristics that are reported here.

Clearly, neither this report, nor any report, could present all of the population estimates that are made possible by the NAEP database. The analysis of the 1986 NAEP data has resulted in the production of many thousands of tables containing estimates of the proficiency of students, and various subgroups of students, in American schools. We have selected a few basic tables for presentation here. The technical details of the estimation process that underlies these tables are covered in the previous parts of this report and not repeated here. A detailed discussion of how to read and use these tables is given by Zwick (1987b).

15.1 Measurement Instruments

A total of 56 assessment booklets and questionnaires was printed for age class 9, 72 for age class 13, and 97 for age class 17. These booklets are enumerated by age level and by type of measurement instrument in Table 15.1. Some of the instruments were used at more than one age/grade level.

The item pool used to develop these booklets is described in Table 15.2. In general, there are two types of items, cognitive and noncognitive. The cognitive items are developed to measure proficiency in particular subject areas, such as reading and mathematics. Cognitive items may be open-ended or multiple-choice. Open-ended responses in reading and science were categorized according to guidelines and then the acceptable categories were combined for the purpose of scaling. The multiple-choice items were scored right or wrong. The noncognitive items are usually questions about the student's or teacher's backgrounds and attitudes but may also probe other areas such as school policies or teaching methods. Noncognitive items are not scored right or wrong. Many items were used at several age levels, and thus the total number of items in an item pool is not the sum of the item pools used for the three age classes.

All of the items in the subject area pools were used for the main NAEP assessment, but not all could be used for the Bridge A and Bridge B assessments. Table 15.3 shows the number cognitive items in each subject area that were used in the separate samples.

The pools of items were divided into subject area blocks. These blocks contain some cognitive and some noncognitive items from a single subject area. All subject area blocks within an age class were designed to take the same amount of time for a student to complete. The blocks for age class 9 were expected to take 13 minutes and the blocks for age classes 13 and 17 were expected to take 16 minutes for a student to complete.

The subject area blocks were then assigned to student assessment booklets. Each booklet for the main NAEP, Bridge A, Bridge B, and Language Minority Probe student samples contained four sections, including a common block and three variable subject area blocks. The common block contained only noncognitive items. The three variable blocks in a booklet might be all from a single subject area (e.g., reading) or from two or three different subject areas.

The other questionnaires (excluded student, teacher, school, and computer coordinator) contained only noncognitive questions. For the questionnaires, the number of items in the noncognitive pools are the same as the number of items in the questionnaires.

More information about the instruments that were developed is contained in Chapters 2 and 4 and in Appendix A. Tables A.1 though A.3 show how the variable blocks were assigned to booklets for the various age classes. Tables A.4 through A.6 depict the blocks with which each variable block was paired. Note that each block was paired with each other block within its subject area, but only with some blocks in the other subject areas. Tables A.7 through A.9 show how many cognitive and noncognitive items were in each block, as well as the number of open-ended items. Tables A.10 through A.12 show the booklets in which each subject area block was placed. Tables A.13 through A.25 list, by subject area, each cognitive and noncognitive item and the block in which it occurred.

15.2 Sample Characteristics

In this section, the characteristics of the final NAEP sample will be described. The process by which the sample was selected is discussed in Chapter 3.

In the 1986 assessment, NAEP contacted 2,095 schools, of which 1,633 contributed data to the assessment. The disposition of these schools is shown in Table 15.4. Some of the schools were unwilling to cooperate and others were believed to be eligible from the sampling frame, but were not. The cooperation rate is calculated as the sum of cooperating school and the schools which were found to have no eligible students divided by the same sum plus the schools that refused or were from districts that refused to cooperate.

Table 15.4 also shows the number of schools in several categories: region of the country (northeast, southeast, central, west), school governance (public, private, Catholic, Bureau of Indian Affairs, Department of Defense), size and type of community, degree of urbanicity, grade span of school, number of teachers, and number of students.

The number of respondents to the teacher questionnaire is summarized in Table 15.5. The first column in this table includes the number of teachers who responded by age class and subject area. The second column contains the number of teachers for whom at least one student is available in the sample (see Chapter 4 for details of the administration of the teacher questionnaire). The final column contains the number of students whose teachers responded to the questionnaire.

NAEP is administered in units called assessment sessions. If the number of students attending an assessment session is less than a predetermined number (see Caldwell & Slobasky, 1988), a makeup session is held to which the missing students are assigned and then assessed. Table 15.6 shows the number of regular and makeup sessions in 1986 NAEP by age class for the main NAEP and two bridge samples.

Altogether, 119,137 students were involved in 1986 NAEP, including excluded students. The breakdown by age class and by sample is shown in Table 15.7.

Tables 15.8 through 15.10 display the distribution of the students in several basic categories for the three age classes: sex, racial/ethnic grouping, region of the country, parental education, and size and type of community. These tables have four columns:

- eligible by age, which means that the students were in an appropriate age group;
- eligible by grade, which means that the students were in an appropriate grade;
- eligible by age and by grade, which means that the students were of both an appropriate age and appropriate grade; and
- eligible by age or by grade, which is the total number of students whose data were collected.

Table 15.11 and 15.12 contain the distribution of students in the same categories by age class for the two bridge samples. Bridge sample students were sampled by age only.

Tables 15.13 through 15.15 contain the distribution of excluded students by age class. The first columns categorizes the excluded students in the Bridge A samples, which were age-only samples. The remaining four columns categorize the excluded students in both the main NAEP and the Bridge B samples. These student numbers are reported separately by age eligibility, grade eligibility, age-and-grade eligibility, and age-or-grade eligibility.

15.3 Population Estimates

The 1986 NAEP samples were designed for estimating the size and certain attributes of a number of populations of students. The estimation procedures use sampling weights, developed by Westat, Inc., that are used in conjunction with the members of the sample (see Chapter 3). In this chapter, all estimates of population parameters use these sampling weights.

Table 15.16 shows the sizes of the various samples and the sums of their sampling weights by grade/age. The sums of the weights for the main NAEP samples, which are by far the largest, estimate the numbers of students who are in each grade/age and who would be assessable. The sum of the weights of the Bridge A and Bridge B samples estimate the number of assessable students in the various age-eligible populations. The sums of the weights of the excluded students estimate the numbers of students in each age or grade/age combination who, in their schools' judgment, would not be assessable. The excluded students from the main NAEP and Bridge B samples are indistinguishable, thus this group of excluded students can be combined with the either the main NAEP or Bridge B samples for total population estimation. Because of changes in age definitions and times of assessment, the Bridge A samples represent different populations.

In most cases, the number of students in a grade/age combination is not of interest; a researcher will be interested in estimating the number of students at either a grade or an age level. For the samples that contain both grade- and age-eligible students, an estimate of the number of students at an age level can be made by summing the weights of only the age-eligible students and adding the corresponding sample of age-eligible excluded students. An estimate of the number of students in a grade sample can be made by summing the weights of grade-eligible students plus the weights of grade-eligible students from the appropriate excluded student sample.

From the main NAEP samples, the next tables estimate how many students are age-eligible and grade-eligible by age class. Tables 15.17 through 15.19 show how many students at a particular grade level are at, in, or above the modal age for that grade, and how many at a particular age level are at, in, or above the modal grade for that age. Along with the counts from these samples, the sum of the weights (Weighted N) for each category is presented, and these sums are estimates of the numbers of students in these categories in the population. The standard errors of these estimates and coefficients of variation are also given.

Tables 15.20 through 15.22 contain the same type of information for the several bridge booklets, by age level. Since the bridge samples do not contain students who were not age-eligible, the sample is separated by below, at, or above modal grade. Note that booklets 1, 2, and 3 are from Bridge A samples and do not represent precisely the same populations as booklets 4 and 5, which were used in Bridge B samples.

The next tables show the sizes of the estimated populations of assessable students for various NAEP reporting categories. These categories include sex, racial/ethnic grouping, region of the country, parents' education, and size and type of community. The estimated subpopulation sizes for the main NAEP samples are shown in Tables 15.23 through 15.25, separately by age eligibility, grade eligibility, and grade/age eligibility. Tables 15.26, 15.27, and 15.28 show the same information for the bridge samples, by booklet assignment.

Tables 15.29 to 15.31 show the estimation total population of excluded students by demographic subgroup. The first column is from Bridge A, which sampled age-eligible students only. The next three columns are derived from main NAEP and Bridge B samples, and so separate age eligibles and grade eligibles.

The students in the main NAEP samples received only three assessment blocks, thus they could be assessed in one, two, or at most three of the assessment areas, but not all. Students were assigned proficiency values in a subject area only if they received at least one assessment block in that area, and thus the sample sizes of students who have proficiency values vary from one subject area to another. Tables 15.32 through Table 15.40 show the number of students with proficiency values in each subject are by age and grade combinations. Tables 15.41 and 15.42 show history and literature sample sizes for grade 11/age 17 (the only age class assessed in these subject areas).

Tables 15.43 to 15.51 contain population estimates of student proficiencies by grade and by subpopulations. The subpopulations are: the sexes, racial/ethnic groupings, ages, regions of the country, size and type of community, parental education, and type of school. For grade 11 students, the results are also presented by the type of high school program. The information about proficiency includes the mean and standard deviation of each subpopulation as well as the value of the 10th, 25th, 50th (median), 75th, and 90th percentiles. Results are shown separately for reading, mathematics, and science. Only overall proficiency is shown for mathematics and science, although subscale estimates were computed for individuals. The standard errors of the estimates are included in parentheses.

Tables 15.52 through 15.114 contain results for more finely defined subpopulations. The major reporting variables (sex, race/ethnicity, parental education) are cross-classified with each other and with other reporting variables (region, articles in the home, and television watching) to define the subpopulations. For example, Table 15.58 cross-classifies sex, racial/ethnic grouping, and parental education with the hours that 3rd graders spend watching television each day. Information included about these subpopulations is the actual sample size, the estimated population size (and its relative variance), the proportion of students in each subpopulation (and its standard error), and the average proficiency of the students (and its standard error).

Table 15.1

Measurement Instruments Developed for 1986 NAEP

	------Age Class-----		
	9	13	17
MAIN NAEP BOOKLETS	46	62	90
BRIDGE A BOOKLETS	3	3	0
BRIDGE B BOOKLETS	2	2	2
LANGUAGE MINORITY PROBE BOOKLETS	1	1	1
EXCLUDED STUDENT QUESTIONNAIRES	1	1	1
TEACHER QUESTIONNAIRES	1	1	1
SCHOOL CHARACTERISTICS QUESTIONNAIRES	1	1	1
COMPUTER COORDINATOR QUESTIONNAIRES	1	1	1
-- TOTAL --	56	72	97

Table 15.2

Number of Items Administered

	------Age Class-----			
	9	13	17	Total
COMMON BACKGROUND	27	28	47	57
READING				
BACKGROUND AND ATTITUDE	76	90	90	113
COGNITIVE	69	73	73	119
MATHEMATICS				
BACKGROUND AND ATTITUDE	39	119	148	195
COGNITIVE	144	311	368	509
SCIENCE				
BACKGROUND AND ATTITUDE	40	85	122	152
COGNITIVE	121	191	238	436
COMPUTER COMPETENCE				
BACKGROUND AND ATTITUDE	49	62	86	114
COGNITIVE	59	136	126	212
U.S. HISTORY				
BACKGROUND AND ATTITUDE	0	0	25	25
COGNITIVE	0	0	141	141
LITERATURE				
BACKGROUND AND ATTITUDE	0	0	43	43
COGNITIVE	0	0	121	121
EXCLUDED STUDENTS	68	68	68	68
TEACHER				
GENERAL	154	150	150	173
ENGLISH	0	13	49	49
MATHEMATICS	0	60	31	71
SCIENCE	0	85	28	96
U.S. HISTORY	0	0	27	27
SCHOOL CHARACTERISTICS	162	166	190	262
COMPUTER COORDINATOR	166	166	166	166
-- TOTAL --	1174	1803	2337	3149

Table 15.3

Number of Cognitive Items
by Type of Administration

	------Age Class-----		
	9	13	17
READING			
MAIN NAEP	69	73	73
BRIDGE A	31	35	0
BRIDGE B	0	0	0
MATHEMATICS			
MAIN NAEP	144	311	368
BRIDGE A	68	98	0
BRIDGE B	68	98	94
SCIENCE			
MAIN NAEP	121	191	238
BRIDGE A	63	83	0
BRIDGE B	63	83	82
COMPUTER COMPETENCE			
MAIN NAEP	59	136	126
BRIDGE A	0	0	0
BRIDGE B	0	0	0
U.S. HISTORY			
MAIN NAEP	0	0	141
BRIDGE A	0	0	0
BRIDGE B	0	0	0
LITERATURE			
MAIN NAEP	0	0	121
BRIDGE A	0	0	0
BRIDGE B	0	0	0

Table 15.4

Characteristics of Schools in Main NAEP (Spiral) Sample

	-------Age Class-------			
	9	13	17	Total
TOTAL ORIGINAL SAMPLE	697	732	554	1983
COOPERATING	594	539	409	1542
OUT-OF RANGE OR CLOSED	17	19	33	69
NO ELIGIBLES ENROLLED	9	89	22	120
DISTRICT REFUSED	46	48	45	139
SCHOOL REFUSED	31	37	45	113
COOPERATION RATE	88.7	88.1	82.7	86.8
REPLACEMENT FOR REFUSALS	41	34	37	112
COOPERATING	38	29	24	91
TOTAL COOPERATING SCHOOLS	632	568	433	1633
TOTAL WITH COMPLETED QUESTIONNAIRES	583	521	392	1496
REGION				
NORTHEAST	142	121	79	342
SOUTHEAST	139	130	101	370
CENTRAL	165	152	121	438
WEST	186	165	132	483
SCHOOL TYPE				
PUBLIC	519	461	389	1369
PRIVATE	46	36	23	105
CATHOLIC	64	68	21	153
BIA	2	3	0	5
DEPARTMENT OF DEFENSE	1	0	0	1
SIZE AND TYPE OF COMMUNITY				
EXTREME RURAL	60	57	49	166
LOW METROPOLITAN	61	54	42	157
HIGH METROPOLITAN	67	59	42	168
MAIN BIG CITY	64	74	42	180
URBAN FRINGE	76	58	47	181
MEDIUM CITY	111	97	70	278
SMALL PLACE	193	169	141	503
URBANICITY				
URBAN	184	171	122	477
SUBURBAN	252	222	171	645
RURAL	196	175	140	511

Table 15.4
(continued)

	-------Age Class-------			
	9	13	17	Total
GRADE SPAN				
KINDERGARTEN TO GRADE 12	44	42	50	136
KINDERGARTEN TO GRADE 6	407	107	0	514
KINDERGARTEN TO GRADE 8	147	159	0	306
GRADE 6 OR 7 TO GRADE 8	5	163	0	168
GRADE 7 TO GRADE 9	0	59	9	68
GRADE 7 TO GRADE 12	0	35	54	89
GRADE 9 TO GRADE 12	0	3	238	241
GRADE 10 TO GRADE 12	0	0	82	82
KINDERGARTEN TO GRADE 3	29	0	0	29
NUMBER OF TEACHERS				
1 - 4	18	14	12	44
5 - 9	79	60	14	153
10 - 19	262	143	56	461
20 - 49	259	274	125	658
50 - 74	13	56	97	166
75 - 99	0	17	73	90
100+	1	4	56	61
NUMBER OF STUDENTS				
1 - 99	20	14	20	54
100 - 299	206	143	67	416
300 - 499	236	144	50	430
500 - 749	126	139	50	315
750 - 999	28	67	49	144
1000 - 1499	12	46	86	144
1500+	3	15	111	129
NO INFORMATION	1	0	0	1

Table 15.5

Number of Responses to Teacher Questionnaire

	Teachers	Teachers with Students in Sample	Students with Teachers in Sample
Grade 3/Age 9			
ENGLISH	774	749	11222
Grade 7/Age 13			
ENGLISH	270	260	6466
MATHEMATICS	263	259	6746
SCIENCE	251	239	6896
Grade 11/Age 17			
ENGLISH	315	307	5905
MATHEMATICS	362	346	4266
SCIENCE	307	299	4365
U.S. HISTORY	259	256	5401

Table 15.6

Number of Assessment Sessions by Type of Administration

	-------Age Class-------			
	9	13	17	Total
MAIN NAEP (Spiral)				
REGULAR	1006	1008	1243	3257
MAKE-UP	5	10	80	95
BRIDGE A				
REGULAR	484	291	--	775
MAKE-UP	5	12	--	17
BRIDGE B				
REGULAR	222	223	199	644
MAKE-UP	1	0	29	30
TOTAL	1723	1544	1551	4818

Table 15.7

Number of Students Assessed and Excluded by Type of Administration

	Age Class 9	Age Class 13	Age Class 17	Total
ASSESSED				
MAIN NAEP	21287	27668	39753	88708
BRIDGE A	6932	6200	--	13132
BRIDGE B	4042	4178	3868	12088
EXCLUDED				
MAIN AND BRIDGE B	1133	1382	1965	4480
BRIDGE A	343	386	--	729
TOTAL	33737	39814	45586	119137

Table 15.8

Number of Students in the Main NAEP (Spiral) Sample

Grade 3/Age 9

	Eligible by			
	Age	Grade	Age & Grade	Age or Grade
TOTAL	16632	18033	13378	21287
SEX:				
MALE	8422	9124	6543	11003
FEMALE	8210	8909	6835	10284
RACE:				
WHITE	10323	10896	8585	12634
BLACK	2966	3356	2287	4035
HISPANIC	2696	3123	2033	3786
OTHER	647	658	473	832
REGION:				
NORTHEAST	3201	3396	2544	4053
SOUTHEAST	4115	4647	3347	5415
CENTRAL	3935	4152	3212	4875
WEST	5672	6103	4462	7313
PARENTS ED:				
LESS THAN HIGH SCHOOL	712	809	522	999
HIGH SCHOOL	2131	2292	1670	2753
GREATER THAN HIGH SCHOOL	876	951	707	1120
GRADUATED COLLEGE	5124	5565	4316	6373
UNKNOWN	7491	8143	5972	9662
SIZE AND TYPE OF COMMUNITY:				
RURAL	1072	1137	866	1343
DISADVANTAGED URBAN	2093	2343	1545	2891
ADVANTAGED URBAN	2008	2138	1666	2480
BIG CITY	2181	2363	1748	2796
FRINGE	1888	1994	1520	2362
MEDIUM	3106	3397	2502	4001
SMALL	4284	4661	3531	5414

Table 15.9

Number of Students in the Main NAEP (Spiral) Sample

Grade 7/Age 13

	Eligible by			
	Age	Grade	Age & Grade	Age or Grade
TOTAL	20554	23527	16413	27668
SEX:				
MALE	10232	11986	7923	14295
FEMALE	10322	11541	8490	13373
RACE:				
WHITE	12460	13871	10263	16068
BLACK	4018	4846	3079	5785
HISPANIC	3339	3966	2506	4799
OTHER	737	844	565	1016
REGION:				
NORTHEAST	3451	4004	2634	4821
SOUTHEAST	5658	6545	4583	7620
CENTRAL	5154	5991	4315	6830
WEST	6502	7254	5054	8702
PARENTS ED:				
LESS THAN HIGH SCHOOL	1556	1998	1151	2403
HIGH SCHOOL	5661	6549	4502	7708
GREATER THAN HIGH SCHOOL	2962	3314	2439	3837
GRADUATED COLLEGE	7410	8194	6158	9446
UNKNOWN	2733	3176	1971	3938
SIZE AND TYPE OF COMMUNITY:				
RURAL	1017	1161	819	1359
DISADVANTAGED URBAN	2004	2632	1542	3094
ADVANTAGED URBAN	1959	2055	1497	2517
BIG CITY	3146	3619	2526	4239
FRINGE	2885	3324	2315	3894
MEDIUM	3414	3980	2812	4582
SMALL	6129	6756	4902	7983

Table 15.10

Number of Students in the Main NAEP (Spiral) Sample

Grade 11/Age 17

	Eligible by			
	Age	Grade	Age & Grade	Age or Grade
TOTAL	31782	31938	23967	39753
SEX:				
MALE	15828	15797	11452	20173
FEMALE	15954	16141	12515	19580
RACE:				
WHITE	22204	22603	17862	26945
BLACK	5360	5230	3401	7189
HISPANIC	3363	3170	2103	4430
OTHER	855	935	601	1189
REGION:				
NORTHEAST	6331	6599	4678	8252
SOUTHEAST	8122	7988	5931	10179
CENTRAL	8298	8215	6556	9957
WEST	9163	9270	6887	11546
PARENTS ED:				
LESS THAN HIGH SCHOOL	3050	2944	1916	4078
HIGH SCHOOL	9004	8847	6585	11266
GREATER THAN HIGH SCHOOL	6897	7021	5473	8445
GRADUATED COLLEGE	11496	11865	9228	14133
UNKNOWN	1189	1112	668	1633
SIZE AND TYPE OF COMMUNITY:				
RURAL	1337	1349	991	1695
DISADVANTAGED URBAN	2336	2083	1300	3119
ADVANTAGED URBAN	3600	3791	2920	4471
BIG CITY	3567	3348	2366	4549
FRINGE	4331	4394	3369	5356
MEDIUM	6258	6351	4922	7687
SMALL	10353	10622	8099	12876

Table 15.11

Number of Students in the Bridge A Sample

	Age 9	Age 13	Age 17
TOTAL	6932	6200	0
SEX:			
MALE	3487	3102	0
FEMALE	3445	3096	0
RACE:			
WHITE	4534	3667	0
BLACK	851	1462	0
HISPANIC	1022	868	0
OTHER	525	203	0
REGION:			
NORTHEAST	1708	1485	0
SOUTHEAST	1583	1418	0
CENTRAL	1714	1613	0
WEST	1937	1788	0
PARENTS ED:			
LESS THAN HIGH SCHOOL	292	502	0
HIGH SCHOOL	1057	1795	0
GREATER THAN HIGH SCHOOL	466	923	0
GRADUATED COLLEGE	2659	2311	0
UNKNOWN	2445	561	0
SIZE AND TYPE OF COMMUNITY:			
RURAL	260	232	0
DISADVANTAGED URBAN	513	886	0
ADVANTAGED URBAN	1043	692	0
BIG CITY	693	788	0
FRINGE	1016	580	0
MEDIUM	1249	1318	0
SMALL	2158	1704	0

Table 15.12

Number of Students in the Bridge B Sample

	Age 9	Age 13	Age 17
TOTAL	4042	4178	3868
SEX:			
MALE	2014	2063	1870
FEMALE	2028	2115	1998
RACE:			
WHITE	2539	2628	2670
BLACK	648	670	630
HISPANIC	682	695	429
OTHER	173	185	139
REGION:			
NORTHEAST	812	772	746
SOUTHEAST	999	1120	1081
CENTRAL	943	956	910
WEST	1316	1346	1145
PARENTS ED:			
LESS THAN HIGH SCHOOL	209	342	382
HIGH SCHOOL	586	1145	1074
GREATER THAN HIGH SCHOOL	229	612	902
GRADUATED COLLEGE	1331	1588	1378
UNKNOWN	1656	471	116
SIZE AND TYPE OF COMMUNITY:			
RURAL	287	250	145
DISADVANTAGED URBAN	437	364	308
ADVANTAGED URBAN	400	345	410
BIG CITY	411	582	427
FRINGE	489	513	598
MEDIUM	821	684	739
SMALL	1197	1440	1241

Table 15.13

Excluded Student Sample by Demographic Characteristics

Grade 3/Age 9

	Bridge A	---------Main NAEP and Bridge B---------			
	Age	Age	Grade	Age and Grade	Age or Grade
TOTAL	343	802	767	436	1133
SEX:					
MALE	229	498	465	250	713
FEMALE	114	304	302	186	420
RACE:					
WHITE	172	284	255	137	402
BLACK	59	152	133	64	221
HISPANIC	92	305	323	201	427
OTHER	20	61	56	34	83
REGION:					
NORTHEAST	80	136	120	80	176
SOUTHEAST	79	132	127	53	206
CENTRAL	54	104	94	39	159
WEST	130	430	426	264	592

Table 15.14

Excluded Student Sample by Demographic Characteristics

Grade 7/Age 13

	Bridge A	---------Main NAEP and Bridge B---------			
	Age	Age	Grade	Age and Grade	Age or Grade
TOTAL	386	773	1052	443	1382
SEX:					
MALE	243	495	686	277	904
FEMALE	143	278	366	166	478
RACE:					
WHITE	126	294	452	156	590
BLACK	96	193	271	116	348
HISPANIC	122	230	267	141	356
OTHER	42	56	62	30	88
REGION:					
NORTHEAST	138	77	125	47	155
SOUTHEAST	67	181	307	122	366
CENTRAL	66	143	144	49	238
WEST	115	372	476	225	623

Table 15.15

Excluded Student Sample by Demographic Characteristics

Grade 11/Age 17

	Bridge A	---------Main NAEP and Bridge B---------			
	Age	Age	Grade	Age and Grade	Age or Grade
TOTAL	0	1368	1150	553	1965
SEX:					
MALE	0	827	718	330	1215
FEMALE	0	530	416	213	733
RACE:					
WHITE	0	588	510	245	853
BLACK	0	404	329	162	571
HISPANIC	0	281	210	110	381
OTHER	0	95	101	36	160
REGION:					
NORTHEAST	0	222	189	100	311
SOUTHEAST	0	342	271	130	483
CENTRAL	0	288	261	109	440
WEST	0	516	429	214	731

Table 15.16

Number of Students by Grade/Age and Type of Assessment

	GRADE 3/AGE 9		GRADE 7/AGE 13		GRADE 11/AGE 17	
ASSESSMENT TYPE	Total	Sum of Weights	Total	Sum of Weights	Total	Sum of Weights
Spiral[+]	21287	3931992	27668	4007907	39753	4136965
Bridge B--Booklet 4[*]	1994	3151352	2032	3008026	1934	3240017
Bridge B--Booklet 5[*]	2048	3121844	2146	3028806	1934	3252949
Excluded Students--Combined Spiral and Bridge B Samples	1133	137280	1382	143847	1965	120169
Bridge A--Booklet 1[**]	2315	3098639	2075	2937402	--	--
Bridge A--Booklet 2[**]	2361	3104555	2054	2950983	--	--
Bridge A--Booklet 3[**]	2256	3112834	2071	2943837	--	--
Excluded Students--Bridge A Samples	343	131664	386	148916	--	--

[+] Sample for both age and grade using new age definitions

[*] Sample for age only using new age definitions

[**] Sample for age only using old age definitions

Table 15.17

Number of Spiral Students, Grade 3/Age 9
(Booklets 6 - 51)

	AGE			
	< 9	= 9	> 9	TOTAL
GRADE < 3				
UNWEIGHTED N	0	2342	0	2342
WEIGHTED N	0	432377	0	432377
STANDARD ERROR	-	19486	-	19486
COEFF. OF VAR.	-	4.51	-	4.51
GRADE = 3				
UNWEIGHTED N	1236	13378	3419	18033
WEIGHTED N	208510	2530844	581923	3321278
STANDARD ERROR	15176	9749	15623	14611
COEFF. OF VAR.	7.28	0.39	2.68	0.44
GRADE > 3				
UNWEIGHTED N	0	912	0	912
WEIGHTED N	0	178337	0	178337
STANDARD ERROR	-	18177	-	18177
COEFF. OF VAR.	-	10.19	-	10.19
GRADE TOTAL				
UNWEIGHTED N	1236	16632	3419	21287
WEIGHTED N	208510	3141559	581923	3931992
STANDARD ERROR	15176	13874	15623	18966
COEFF. OF VAR.	7.28	0.44	2.68	0.48

Table 15.18

Number of Spiral Students, Grade 7/Age 13
(Booklets 6 - 67)

	AGE			
	< 13	= 13	> 13	TOTAL
GRADE < 7				
UNWEIGHTED N	0	2775	0	2775
WEIGHTED N	0	646504	0	646504
STANDARD ERROR	-	23559	-	23559
COEFF. OF VAR.	-	3.64	-	3.64
GRADE = 7				
UNWEIGHTED N	1751	16413	5363	23527
WEIGHTED N	257520	2062373	759124	3079017
STANDARD ERROR	16768	3873	16735	10959
COEFF. OF VAR.	6.51	0.19	2.20	0.36
GRADE > 7				
UNWEIGHTED N	0	1366	0	1366
WEIGHTED N	0	282386	0	282386
STANDARD ERROR	-	22763	-	22763
COEFF. OF VAR.	-	8.06	-	8.06
GRADE TOTAL				
UNWEIGHTED N	1751	20554	5363	27668
WEIGHTED N	257520	2991263	759124	4007907
STANDARD ERROR	16768	12922	16735	16317
COEFF. OF VAR.	6.51	0.43	2.20	0.41

Table 15.19

Number of Spiral Students, Grade 11/Age 17
(Booklets 6 - 95)

	AGE < 17	AGE = 17	AGE > 17	TOTAL
GRADE < 11				
UNWEIGHTED N	0	5613	0	5613
WEIGHTED N	0	692940	0	692940
STANDARD ERROR	-	16672	-	16672
COEFF. OF VAR.	-	2.41	-	2.41
GRADE = 11				
UNWEIGHTED N	3264	23967	4707	31938
WEIGHTED N	356364	2270022	561849	3188235
STANDARD ERROR	17845	3696	16124	8536
COEFF. OF VAR.	5.01	0.16	2.87	0.27
GRADE > 11				
UNWEIGHTED N	0	2202	0	2202
WEIGHTED N	0	255790	0	255790
STANDARD ERROR	-	17040	-	17040
COEFF. OF VAR.	-	6.66	-	6.66
GRADE TOTAL				
UNWEIGHTED N	3264	31782	4707	39753
WEIGHTED N	356364	3218752	561849	4136965
STANDARD ERROR	17845	8501	16124	13025
COEFF. OF VAR.	5.01	0.26	2.87	0.31

Table 15.20

Number of Bridge Students, Age 9
(Booklets 1 - 5)

	Bridge Booklet				
	1*	2*	3*	4**	5**
< MODAL GRADE					
UNWEIGHTED N	825	795	758	280	280
WEIGHTED N	1064318	1013447	1084801	385478	430998
STANDARD ERROR	55927	53245	62079	33886	36675
COEFF. OF VAR.	5.25	5.25	5.72	8.79	8.51
- MODAL GRADE					
UNWEIGHTED N	1482	1559	1491	1610	1667
WEIGHTED N	2023333	2083592	2020543	2604318	2554347
STANDARD ERROR	54618	63036	62539	48797	41097
COEFF. OF VAR.	2.70	3.03	3.10	1.87	1.61
> MODAL GRADE					
UNWEIGHTED N	8	7	7	104	101
WEIGHTED N	10988	7515	7489	161557	136499
STANDARD ERROR	3697	2793	2521	56003	17635
COEFF. OF VAR.	33.64	37.16	33.66	34.66	12.92
TOTAL					
UNWEIGHTED N	2315	2361	2256	1994	2048
WEIGHTED N	3098639	3104555	3112834	3151352	3121844
STANDARD ERROR	16593	20282	14390	20051	26874
COEFF. OF VAR.	0.54	0.65	0.46	0.64	0.86

*Students who took these booklets have reading, mathematics, and science plausible values; modal grade is grade 4.

**Students who took these booklets have mathematics and science plausible values; modal grade is grade 3.

Table 15.21

Number of Bridge Students, Age 13
(Booklets 1 - 5)

	Bridge Booklet				
	1*	2*	3*	4**	5**
< MODAL GRADE					
UNWEIGHTED N	693	651	655	248	260
WEIGHTED N	1000038	975363	915681	409390	452561
STANDARD ERROR	74097	68626	49935	74647	137092
COEFF. OF VAR.	7.41	7.04	5.45	18.23	30.29
= MODAL GRADE					
UNWEIGHTED N	1372	1390	1403	1642	1743
WEIGHTED N	1928568	1958298	2014274	2404636	2395404
STANDARD ERROR	77648	79717	51542	93872	126803
COEFF. OF VAR.	4.03	4.07	2.56	3.90	5.29
> MODAL GRADE					
UNWEIGHTED N	10	13	13	142	143
WEIGHTED N	8796	17322	13882	194000	180841
STANDARD ERROR	6317	6447	7946	32980	22955
COEFF. OF VAR.	71.82	37.22	57.24	17.00	12.69
TOTAL					
UNWEIGHTED N	2075	2054	2071	2032	2146
WEIGHTED N	2937402	2950983	2943837	3008026	3028806
STANDARD ERROR	21332	24449	21182	22738	15282
COEFF. OF VAR.	0.73	0.83	0.72	0.76	0.50

*Students who took these booklets have reading, mathematics, and science plausible values; modal grade is grade 8.

**Students who took these booklets have mathematics and science plausible values; modal grade is grade 7.

Table 15.22

Number of Bridge Students, Age 17
(Booklets 4 - 5)

	Bridge Booklet				
	1	2	3	4*	5*
< MODAL GRADE					
UNWEIGHTED N	0	0	0	358	332
WEIGHTED N	0	0	0	521912	569292
STANDARD ERROR	-	-	-	47386	47724
COEFF. OF VAR.	-	-	-	9.08	8.38
- MODAL GRADE					
UNWEIGHTED N	0	0	0	1415	1473
WEIGHTED N	0	0	0	2406593	2484713
STANDARD ERROR	-	-	-	52550	52069
COEFF. OF VAR.	-	-	-	2.18	2.10
> MODAL GRADE					
UNWEIGHTED N	0	0	0	161	129
WEIGHTED N	0	0	0	311511	198945
STANDARD ERROR	-	-	-	32298	21398
COEFF. OF VAR.	-	-	-	10.37	10.76
TOTAL					
UNWEIGHTED N	0	0	0	1934	1934
WEIGHTED N	0	0	0	3240017	3252949
STANDARD ERROR	-	-	-	13772	10159
COEFF. OF VAR.	-	-	-	0.43	0.31

*Students who took these booklets have mathematics and science plausible values; modal grade is grade 11.

Table 15.23

Estimated Total Number of Students in the Population Eligible for Spiral Assessment

Grade 3/Age 9, Weighted

	Eligible by		
	Age	Grade	Grade/Age
TOTAL	3141559	3321278	3931992
SEX:			
MALE	1567321	1658242	2010984
FEMALE	1574237	1663035	1921008
RACE:			
WHITE	2271105	2377130	2773153
BLACK	441950	475627	580336
HISPANIC	316905	352624	436379
OTHER	111598	115897	142124
REGION:			
NORTHEAST	657236	681455	817351
SOUTHEAST	699613	752156	890668
CENTRAL	923216	965033	1137030
WEST	908020	963708	1146791
PARENTS ED:			
< HIGH SCHOOL	131316	141487	176436
HIGH SCHOOL	416636	432832	520793
> HIGH SCHOOL	166727	177790	208244
GRADUATED COLLEGE	968207	1034473	1186181
UNKNOWN	1411270	1492215	1778771
SIZE AND TYPE OF COMMUNITY:			
RURAL	293166	302728	359727
DISADVANTAGED URBAN	258954	282235	352024
ADVANTAGED URBAN	381331	405166	466861
BIG CITY	297740	311031	373471
FRINGE	364431	375428	447383
MEDIUM	535302	565747	675622
SMALL	1010635	1078942	1256904

Table 15.24

Estimated Total Number of Students in the Population Eligible for Spiral Assessment

Grade 7/Age 13, Weighted

		Eligible by	
	Age	Grade	Grade/Age
TOTAL	2991263	3079017	4007907
SEX:			
MALE	1541750	1593965	2128490
FEMALE	1449513	1485052	1879417
RACE:			
WHITE	2145908	2178573	2781946
BLACK	436915	460779	636841
HISPANIC	296344	323566	431632
OTHER	112096	116099	157488
REGION:			
NORTHEAST	610242	638455	830292
SOUTHEAST	687441	705074	936310
CENTRAL	816427	849132	1085672
WEST	898675	908956	1187272
PARENTS ED:			
< HIGH SCHOOL	217746	245840	334210
HIGH SCHOOL	821310	867910	1122312
> HIGH SCHOOL	444494	454059	573892
GRADUATED COLLEGE	1100343	1109545	1402384
UNKNOWN	382989	374855	539028
SIZE AND TYPE OF COMMUNITY:			
RURAL	184026	198493	249876
DISADVANTAGED URBAN	212154	250926	328053
ADVANTAGED URBAN	335761	326645	435215
BIG CITY	342193	361595	459189
FRINGE	355191	366450	478791
MEDIUM	451977	472968	604822
SMALL	1109961	1101941	1451962

Table 15.25

Estimated Total Number of Students in the Population Eligible for Spiral Assessment

Grade 11/Age 17, Weighted

	Eligible by		
	Age	Grade	Grade/Age
TOTAL	3218752	3188235	4136965
SEX:			
MALE	1637504	1605264	2146872
FEMALE	1581248	1582971	1990093
RACE:			
WHITE	2454103	2429584	3053113
BLACK	425180	420955	599499
HISPANIC	239970	231839	342771
OTHER	99499	105858	141581
REGION:			
NORTHEAST	760527	772512	997946
SOUTHEAST	679527	660859	897434
CENTRAL	936492	917117	1159932
WEST	857844	852943	1103710
PARENTS ED:			
< HIGH SCHOOL	286613	266633	394278
HIGH SCHOOL	901963	867463	1162109
> HIGH SCHOOL	686664	695486	865573
GRADUATED COLLEGE	1214724	1237960	1532637
UNKNOWN	111782	103724	158414
SIZE AND TYPE OF COMMUNITY:			
RURAL	140537	139899	178611
DISADVANTAGED URBAN	192108	168539	271577
ADVANTAGED URBAN	404668	437120	527094
BIG CITY	273140	255547	363232
FRINGE	496195	496725	631919
MEDIUM	504865	503134	638491
SMALL	1207238	1187271	1526041

Table 15.26

Estimated Total Number of Students Eligible for Assessment by Bridge Sample

Age 9, Weighted

	BRIDGE A			BRIDGE B	
	BOOKLET 1	BOOKLET 2	BOOKLET 3	BOOKLET 4	BOOKLET 5
TOTAL	3098639	3104555	3112834	3151352	3121844
SEX:					
MALE	1513328	1528517	1614911	1586069	1558197
FEMALE	1585312	1576038	1497923	1565283	1563647
RACE:					
WHITE	2239076	2245501	2251748	2281491	2246936
BLACK	427691	432972	429194	444069	438022
HISPANIC	321255	309898	315744	312820	323488
OTHER	110617	116184	116147	112972	113397
REGION:					
NORTHEAST	647611	673694	646732	700123	706970
SOUTHEAST	707711	683262	708425	667800	704131
CENTRAL	894822	897240	884580	992571	879846
WEST	851126	851944	880282	836375	837373
PARENTS ED:					
< HIGH SCHOOL	129664	133526	130625	148026	172975
- HIGH SCHOOL	480533	540712	502159	407702	475574
> HIGH SCHOOL	199661	206521	208628	202829	143644
GRADUATED COLLEGE	1180756	1200317	1139467	1060530	1075184
UNKNOWN	1104628	1021203	1124254	1280633	1247992
SIZE AND TYPE OF COMMUNITY:					
RURAL	131748	157369	153949	362786	193753
DISADVANTAGED URBAN	183010	177983	194386	317002	232967
ADVANTAGED URBAN	517107	513362	534404	360928	372294
BIG CITY	251498	272930	266679	316439	172480
FRINGE	410427	424339	384390	337960	603800
MEDIUM	482355	455960	426875	587028	441577
SMALL	1122495	1102612	1152150	869208	1104973

Table 15.27

Estimated Total Number of Students Eligible for Assessment by Bridge Sample

Age 13, Weighted

	BRIDGE A			BRIDGE B	
	BOOKLET 1	BOOKLET 2	BOOKLET 3	BOOKLET 4	BOOKLET 5
TOTAL	2937402	2950983	2943837	3008026	3028806
SEX:					
MALE	1467700	1465382	1464555	1496077	1518031
FEMALE	1469456	1485600	1479088	1511950	1510774
RACE:					
WHITE	2126752	2141182	2125403	2154960	2169537
BLACK	430424	428826	440654	441065	449180
HISPANIC	287880	271851	276136	292548	299453
OTHER	92346	109124	101645	119453	110635
REGION:					
NORTHEAST	653213	663776	661239	597610	582830
SOUTHEAST	714405	736100	735176	697252	745166
CENTRAL	782547	766492	767112	844402	851214
WEST	828271	824659	820122	871474	859251
PARENTS ED:					
< HIGH SCHOOL	247165	233860	209186	208139	225451
= HIGH SCHOOL	866426	887299	943903	803110	855055
> HIGH SCHOOL	493495	435220	427030	472907	426546
GRADUATED COLLEGE	1044757	1136582	1085363	1203210	1178812
UNKNOWN	243633	216447	236035	316897	328894
SIZE AND TYPE OF COMMUNITY:					
RURAL	181662	162410	186124	192069	218660
DISADVANTAGED URBAN	273163	232200	278075	227973	176697
ADVANTAGED URBAN	336985	340383	336147	192679	357848
BIG CITY	343696	327501	337060	479026	365954
FRINGE	252105	258556	255761	384401	373994
MEDIUM	466608	482638	477884	374746	397159
SMALL	1083183	1147294	1072786	1157132	1138494

Table 15.28

Estimated Total Number of Students Eligible for Assessment by Bridge Sample

Age 17, Weighted

	BRIDGE A			BRIDGE B	
	BOOKLET 1	BOOKLET 2	BOOKLET 3	BOOKLET 4	BOOKLET 5
TOTAL	0	0	0	3240017	3252949
SEX:					
MALE	0	0	0	1552203	1626960
FEMALE	0	0	0	1687814	1625989
RACE:					
WHITE	0	0	0	2465764	2468639
BLACK	0	0	0	430391	429952
HISPANIC	0	0	0	241481	248189
OTHER	0	0	0	102381	106169
REGION:					
NORTHEAST	0	0	0	799647	737680
SOUTHEAST	0	0	0	783775	700061
CENTRAL	0	0	0	843631	983235
WEST	0	0	0	824428	847085
PARENTS ED:					
< HIGH SCHOOL	0	0	0	271395	262663
- HIGH SCHOOL	0	0	0	882974	920148
> HIGH SCHOOL	0	0	0	810293	748687
GRADUATED COLLEGE	0	0	0	1165164	1218276
UNKNOWN	0	0	0	96000	88064
SIZE AND TYPE OF COMMUNITY:					
RURAL	0	0	0	43064	158648
DISADVANTAGED URBAN	0	0	0	280426	125606
ADVANTAGED URBAN	0	0	0	348843	472761
BIG CITY	0	0	0	253271	321808
FRINGE	0	0	0	566581	601024
MEDIUM	0	0	0	647123	448500
SMALL	0	0	0	1100710	1124602

Table 15.29

Estimated Total Population of Excluded Students

Grade 3/Age 9, Weighted

	Bridge A	-------Main and Bridge B-----		
	Age	Age	Grade	Age or Grade
TOTAL	131664	89319	94135	137280
SEX:				
MALE	86979	58325	59065	89291
FEMALE	44685	30994	35070	47989
RACE:				
WHITE	66692	40510	41773	62623
BLACK	21760	15508	15614	24279
HISPANIC	33896	23836	26445	36280
OTHER	9316	9464	10303	14097
REGION:				
NORTHEAST	28164	19264	18377	25983
SOUTHEAST	29640	15469	17669	26944
CENTRAL	22779	15823	17440	26875
WEST	51081	38762	40649	57477

Table 15.30

Estimated Total Population of Excluded Students

Grade 7/Age 13, Weighted

	Bridge A	-------Main and Bridge B-----		
	Age	Age	Grade	Age or Grade
TOTAL	148916	77668	105840	143847
SEX:				
MALE	96477	49596	68928	94201
FEMALE	52440	28072	36912	49646
RACE:				
WHITE	57522	35017	53700	72270
BLACK	34253	16896	22533	30430
HISPANIC	41704	16827	20431	27444
OTHER	15438	8928	9176	13704
REGION:				
NORTHEAST	53251	7374	13202	16685
SOUTHEAST	28983	19519	31800	39609
CENTRAL	26243	17326	18437	29979
WEST	40440	33449	42401	57574

Table 15.31

Estimated Total Population of Excluded Students

Grade 11/Age 17, Weighted

	Bridge A	-------Main and Bridge B-----		
	Age	Age	Grade	Age or Grade
TOTAL	0	79149	72744	120169
SEX:				
MALE	0	48103	45950	74512
FEMALE	0	30659	26208	45039
RACE:				
WHITE	0	37956	35561	57498
BLACK	0	19937	17309	29513
HISPANIC	0	13786	9655	18292
OTHER	0	7469	10219	14867
REGION:				
NORTHEAST	0	12914	12638	19656
SOUTHEAST	0	17536	15369	26199
CENTRAL	0	19676	19391	31156
WEST	0	29024	25346	43157

Table 15.32

Spiral Sample Students Who Have Reading Scale Scores
(Variables REDVAL1 to REDVAL5)

Grade 3/Age 9

	AGE			
	< 9	= 9	> 9	TOTAL
GRADE < 3				
UNWEIGHTED N	0	1281	0	1281
WEIGHTED N	0	238526	0	238526
STANDARD ERROR	-	12042	-	12042
COEFF. OF VAR.	-	5.05	-	5.05
GRADE = 3				
UNWEIGHTED N	663	7289	1841	9793
WEIGHTED N	111321	1386813	314145	1812279
STANDARD ERROR	9060	8288	9237	9488
COEFF. OF VAR.	8.14	0.60	2.94	0.52
GRADE > 3				
UNWEIGHTED N	0	501	0	501
WEIGHTED N	0	99616	0	99616
STANDARD ERROR	-	11672	-	11672
COEFF. OF VAR.	-	11.72	-	11.72
TOTAL				
UNWEIGHTED N	663	9071	1841	11575
WEIGHTED N	111321	1724955	314145	2150421
STANDARD ERROR	9060	9982	9237	11533
COEFF. OF VAR.	8.14	0.58	2.94	0.54

Table 15.33

Spiral Sample Students Who Have Reading Scale Scores
(Variables REDVAL1 to REDVAL5)

Grade 7/Age 13

	AGE			
	< 13	= 13	> 13	TOTAL
GRADE < 7				
UNWEIGHTED N	0	1130	0	1130
WEIGHTED N	0	270315	0	270315
STANDARD ERROR	-	12485	-	12485
COEFF. OF VAR.	-	4.62	-	4.62
GRADE = 7				
UNWEIGHTED N	713	6638	2162	9513
WEIGHTED N	107052	835432	303535	1246019
STANDARD ERROR	7977	6210	9439	6893
COEFF. OF VAR.	7.45	0.74	3.11	0.55
GRADE > 7				
UNWEIGHTED N	0	528	0	528
WEIGHTED N	0	111168	0	111168
STANDARD ERROR	-	9560	-	9560
COEFF. OF VAR.	-	8.60	-	8.60
TOTAL				
UNWEIGHTED N	713	8296	2162	11171
WEIGHTED N	107052	1216915	303535	1627503
STANDARD ERROR	7977	11441	9439	11292
COEFF. OF VAR.	7.45	0.94	3.11	0.69

Table 15.34

Spiral Sample Students Who Have Reading Scale Scores
(Variables REDVAL1 to REDVAL5)

Grade 11/Age 17

	AGE			
	< 17	= 17	> 17	TOTAL
GRADE < 11				
UNWEIGHTED N	0	2889	0	2889
WEIGHTED N	0	361108	0	361108
STANDARD ERROR	-	9755	-	9755
COEFF. OF VAR.	-	2.70	-	2.70
GRADE = 11				
UNWEIGHTED N	1703	12393	2414	16510
WEIGHTED N	187073	1165375	285703	1638151
STANDARD ERROR	10196	6762	9868	7343
COEFF. OF VAR.	5.45	0.58	3.45	0.45
GRADE > 11				
UNWEIGHTED N	0	1136	0	1136
WEIGHTED N	0	130446	0	130446
STANDARD ERROR	-	8579	-	8579
COEFF. OF VAR.	-	6.58	-	6.58
TOTAL				
UNWEIGHTED N	1703	16418	2414	20535
WEIGHTED N	187073	1656930	285703	2129706
STANDARD ERROR	10196	7643	9868	8340
COEFF. OF VAR.	5.45	0.46	3.45	0.39

Table 15.35

Spiral Sample Students Who Have Mathematics Scale Scores (Variables MRPCMP1 to MRPCMP5)

Grade 3/Age 9

	AGE			
	< 9	= 9	> 9	TOTAL
GRADE < 3				
UNWEIGHTED N	0	1462	0	1462
WEIGHTED N	0	271299	0	271299
STANDARD ERROR	-	15134	-	15134
COEFF. OF VAR.	-	5.58	-	5.58
GRADE = 3				
UNWEIGHTED N	769	8102	2074	10945
WEIGHTED N	132771	1530675	354866	2018312
STANDARD ERROR	10248	10781	10279	15656
COEFF. OF VAR.	7.72	0.70	2.90	0.78
GRADE > 3				
UNWEIGHTED N	0	527	0	527
WEIGHTED N	0	102306	0	102306
STANDARD ERROR	-	10523	-	10523
COEFF. OF VAR.	-	10.29	-	10.29
TOTAL				
UNWEIGHTED N	769	10091	2074	12934
WEIGHTED N	132771	1904280	354866	2391917
STANDARD ERROR	10248	14811	10279	18054
COEFF. OF VAR.	7.72	0.78	2.90	0.75

Table 15.36

Spiral Sample Students Who Have Mathematics Scale Scores
(Variables MRPCMP1 to MRPCMP5)

Grade 7/Age 13

	AGE			
	< 13	= 13	> 13	TOTAL
GRADE < 7				
UNWEIGHTED N	0	1448	0	1448
WEIGHTED N	0	333080	0	333080
STANDARD ERROR	-	15348	-	15348
COEFF. OF VAR.	-	4.61	-	4.61
GRADE = 7				
UNWEIGHTED N	911	8462	2812	12185
WEIGHTED N	134283	1063563	398199	1596045
STANDARD ERROR	10060	8324	8856	10692
COEFF. OF VAR.	7.49	0.78	2.22	0.67
GRADE > 7				
UNWEIGHTED N	0	692	0	692
WEIGHTED N	0	142784	0	142784
STANDARD ERROR	-	12783	-	12783
COEFF. OF VAR.	-	8.95	-	8.95
TOTAL				
UNWEIGHTED N	911	10602	2812	14325
WEIGHTED N	134283	1539427	398199	2071909
STANDARD ERROR	10060	12874	8856	14557
COEFF. OF VAR.	7.49	0.84	2.22	0.70

Table 15.37

Spiral Sample Students Who Have Mathematics Scale Scores (Variables MRPCMP1 to MRPCMP5)

Grade 11/Age 17

	AGE < 17	AGE = 17	AGE > 17	TOTAL
GRADE < 11				
UNWEIGHTED N	0	2011	0	2011
WEIGHTED N	0	245638	0	245638
STANDARD ERROR	-	8513	-	8513
COEFF. OF VAR.	-	3.47	-	3.47
GRADE = 11				
UNWEIGHTED N	1157	8850	1843	11850
WEIGHTED N	125937	842302	222496	1190734
STANDARD ERROR	7688	6889	8002	9237
COEFF. OF VAR.	6.10	0.82	3.60	0.78
GRADE > 11				
UNWEIGHTED N	0	799	0	799
WEIGHTED N	0	94768	0	94768
STANDARD ERROR	-	7425	-	7425
COEFF. OF VAR.	-	7.84	-	7.84
TOTAL				
UNWEIGHTED N	1157	11660	1843	14660
WEIGHTED N	125937	1182708	222496	1531141
STANDARD ERROR	7688	6612	8002	9626
COEFF. OF VAR.	6.10	0.56	3.60	0.63

Table 15.38

Spiral Sample Students Who Have Science Scale Scores
(Variables SRPCMP1 to SRPCMP5)

Grade 3/Age 9

	AGE			
	< 9	= 9	> 9	TOTAL
GRADE < 3				
UNWEIGHTED N	0	1420	0	1420
WEIGHTED N	0	264118	0	264118
STANDARD ERROR	-	13164	-	13164
COEFF. OF VAR.	-	4.98	-	4.98
GRADE = 3				
UNWEIGHTED N	743	8140	2163	11046
WEIGHTED N	124264	1535163	368634	2028061
STANDARD ERROR	9532	11748	10176	13289
COEFF. OF VAR.	7.67	0.77	2.76	0.66
GRADE > 3				
UNWEIGHTED N	0	520	0	520
WEIGHTED N	0	105268	0	105268
STANDARD ERROR	-	11319	-	11319
COEFF. OF VAR.	-	10.75	-	10.75
TOTAL				
UNWEIGHTED N	743	10080	2163	12986
WEIGHTED N	124264	1904549	368634	2397447
STANDARD ERROR	9532	11629	10176	14036
COEFF. OF VAR.	7.67	0.61	2.76	0.59

Table 15.39

Spiral Sample Students Who Have Science Scale Scores
(Variables SRPCMP1 to SRPCMP5)

Grade 7/Age 13

	AGE			
	< 13	= 13	> 13	TOTAL
GRADE < 7				
UNWEIGHTED N	0	1442	0	1442
WEIGHTED N	0	327397	0	327397
STANDARD ERROR	-	14965	-	14965
COEFF. OF VAR.	-	4.57	-	4.57
GRADE = 7				
UNWEIGHTED N	923	8473	2746	12142
WEIGHTED N	133754	1068670	388401	1590825
STANDARD ERROR	9247	8333	11362	11054
COEFF. OF VAR.	6.91	0.78	2.93	0.69
GRADE > 7				
UNWEIGHTED N	0	692	0	692
WEIGHTED N	0	145400	0	145400
STANDARD ERROR	-	13434	-	13434
COEFF. OF VAR.	-	9.24	-	9.24
TOTAL				
UNWEIGHTED N	923	10607	2746	14276
WEIGHTED N	133754	1541468	388401	2063623
STANDARD ERROR	9247	12429	11362	15009
COEFF. OF VAR.	6.91	0.81	2.93	0.73

Table 15.40

Spiral Sample Students Who Have Science Scale Scores
(Variables SRPCMP1 to SRPCMP5)

Grade 11/Age 17

	AGE < 17	AGE = 17	AGE > 17	TOTAL
GRADE < 11				
UNWEIGHTED N	0	2079	0	2079
WEIGHTED N	0	254934	0	254934
STANDARD ERROR	-	7272	-	7272
COEFF. OF VAR.	-	2.85	-	2.85
GRADE = 11				
UNWEIGHTED N	1172	8878	1694	11744
WEIGHTED N	127558	845271	201564	1174394
STANDARD ERROR	6689	6818	6903	8186
COEFF. OF VAR.	5.24	0.81	3.42	0.70
GRADE > 11				
UNWEIGHTED N	0	851	0	851
WEIGHTED N	0	101266	0	101266
STANDARD ERROR	-	7975	-	7975
COEFF. OF VAR.	-	7.88	-	7.88
TOTAL				
UNWEIGHTED N	1172	11808	1694	14674
WEIGHTED N	127558	1201472	201564	1530594
STANDARD ERROR	6689	9570	6903	10636
COEFF. OF VAR.	5.24	0.80	3.42	0.69

Table 15.41

Spiral Sample Students Who Have History Scale Scores (Variable HISVAL)

Grade 11/Age 17

	AGE < 17	AGE = 17	AGE > 17	TOTAL
GRADE < 11				
UNWEIGHTED N	0	0	0	0
WEIGHTED N	0	0	0	0
STANDARD ERROR	-	-	-	-
COEFF. OF VAR.	-	-	-	-
GRADE = 11				
UNWEIGHTED N	819	5862	1131	7812
WEIGHTED N	87824	548766	135695	772285
STANDARD ERROR	4649	5386	5106	7030
COEFF. OF VAR.	5.29	0.98	3.76	0.91
GRADE > 11				
UNWEIGHTED N	0	0	0	0
WEIGHTED N	0	0	0	0
STANDARD ERROR	-	-	-	-
COEFF. OF VAR.	-	-	-	-
TOTAL				
UNWEIGHTED N	819	5862	1131	7812
WEIGHTED N	87824	548766	135695	772285
STANDARD ERROR	4649	5386	5106	7030
COEFF. OF VAR.	5.29	0.98	3.76	0.91

Table 15.42

Spiral Sample Students Who Have Literature Scale Scores (Variable LITVAL)

Grade 11/Age 17

	AGE			
	< 17	= 17	> 17	TOTAL
GRADE < 11				
UNWEIGHTED N	0	0	0	0
WEIGHTED N	0	0	0	0
STANDARD ERROR	-	-	-	-
COEFF. OF VAR.	-	-	-	-
GRADE = 11				
UNWEIGHTED N	819	5862	1131	7812
WEIGHTED N	87824	548766	135695	772285
STANDARD ERROR	4649	5386	5106	7030
COEFF. OF VAR.	5.29	0.98	3.76	0.91
GRADE > 11				
UNWEIGHTED N	0	0	0	0
WEIGHTED N	0	0	0	0
STANDARD ERROR	-	-	-	-
COEFF. OF VAR.	-	-	-	-
TOTAL				
UNWEIGHTED N	819	5862	1131	7812
WEIGHTED N	87824	548766	135695	772285
STANDARD ERROR	4649	5386	5106	7030
COEFF. OF VAR.	5.29	0.98	3.76	0.91

Table 15.43

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups

Reading, Grade 3

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	9793	1,812,278(1%)	38.0(0.2)	8.4(0.1)	27.0(0.3)	32.2(0.3)	38.3(0.2)	44.0(0.2)	48.8(0.2)
SEX									
MALE	4934	900,205(1%)	37.2(0.2)	8.6(0.1)	25.8(0.3)	31.2(0.4)	37.3(0.3)	43.4(0.3)	48.3(0.4)
FEMALE	4859	912,073(1%)	38.8(0.2)	8.1(0.1)	28.2(0.3)	33.1(0.3)	39.1(0.3)	44.5(0.3)	49.2(0.4)
ETHNICITY/RACE									
WHITE	5920	1,298,525(1%)	39.7(0.2)	7.9(0.1)	29.3(0.4)	34.3(0.3)	40.0(0.2)	45.3(0.2)	49.8(0.3)
BLACK	1821	259,284(2%)	33.3(0.5)	7.9(0.2)	23.1(0.5)	27.8(0.4)	33.2(0.6)	38.9(0.5)	43.5(0.5)
HISPANIC	1687	190,786(3%)	33.2(0.3)	7.8(0.1)	23.1(0.4)	27.7(0.4)	33.0(0.3)	38.5(0.3)	43.4(0.6)
OTHER	365	63,681(4%)	36.1(0.8)	8.7(0.4)	25.0(1.1)	30.2(0.8)	35.8(1.1)	42.6(1.1)	48.1(0.9)
AGE									
< MODAL AGE	663	111,320(8%)	37.9(0.5)	8.1(0.3)	27.1(0.7)	32.2(0.6)	38.2(0.4)	43.7(1.0)	48.3(0.6)
= MODAL AGE	7289	1,386,812(1%)	39.0(0.2)	8.1(0.1)	28.4(0.3)	33.4(0.2)	39.3(0.2)	44.7(0.2)	49.4(0.3)
> MODAL AGE	1841	314,145(3%)	33.5(0.4)	8.4(0.2)	23.0(0.5)	27.6(0.4)	33.2(0.4)	39.3(0.4)	44.6(0.5)
REGION									
NORTHEAST	1837	372,030(1%)	39.1(0.3)	8.3(0.2)	28.2(0.5)	33.3(0.6)	39.3(0.4)	44.9(0.5)	49.9(0.3)
SOUTHEAST	2563	413,767(7%)	37.2(0.3)	8.3(0.1)	26.1(0.6)	31.4(0.5)	37.4(0.5)	43.2(0.3)	47.7(0.4)
CENTRAL	2092	503,501(6%)	39.2(0.4)	8.3(0.1)	28.1(0.5)	33.6(0.4)	39.6(0.4)	45.0(0.3)	49.6(0.5)
WEST	3301	522,979(2%)	36.8(0.4)	8.4(0.1)	26.0(0.3)	31.0(0.4)	36.7(0.4)	42.8(0.5)	47.9(0.4)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	632	170,908(20%)	38.8(0.9)	8.2(0.2)	28.2(1.0)	33.0(1.0)	38.8(0.8)	44.7(0.7)	49.3(1.3)
LOW METROPOLITAN	1246	148,863(13%)	31.8(0.5)	8.1(0.2)	21.4(0.4)	26.1(0.7)	31.6(0.7)	37.1(0.7)	42.4(0.6)
HIGH METROPOLITAN	1174	224,942(16%)	41.1(0.6)	7.7(0.3)	30.8(0.8)	36.2(0.8)	41.5(0.6)	46.3(0.5)	50.7(0.5)
BIG CITY	1318	174,082(15%)	36.6(0.5)	8.4(0.2)	25.9(0.5)	30.5(0.6)	36.4(0.6)	42.6(0.5)	47.8(0.6)
URBAN FRINGE	1058	200,505(12%)	38.2(0.4)	7.9(0.2)	27.8(0.5)	32.6(0.6)	38.4(0.5)	43.7(0.5)	48.6(0.5)
MEDIUM CITY	1845	307,283(15%)	38.0(0.4)	8.2(0.2)	27.2(0.5)	32.2(0.8)	38.1(0.5)	43.8(0.3)	48.6(0.4)
SMALL PLACE	2520	585,692(10%)	38.5(0.4)	8.2(0.1)	27.7(0.7)	32.9(0.5)	38.7(0.4)	44.3(0.4)	49.0(0.5)
PARENTAL EDUCATION									
LESS THAN H.S.	444	75,737(7%)	34.3(0.5)	7.6(0.3)	24.5(0.5)	29.0(0.6)	34.1(0.8)	39.5(0.8)	44.2(1.2)
GRADUATED H.S.	1235	230,851(5%)	36.6(0.4)	8.1(0.2)	25.5(0.8)	31.0(0.4)	37.0(0.4)	42.4(0.6)	46.6(0.7)
SOME EDUC AFTER H.S.	512	97,670(6%)	38.4(0.5)	9.1(0.3)	26.2(0.6)	32.3(1.0)	38.4(0.8)	45.3(0.8)	50.4(0.8)
GRADUATED COLLEGE	3029	565,470(2%)	40.1(0.2)	8.4(0.1)	28.9(0.4)	34.4(0.3)	40.5(0.3)	46.1(0.2)	50.7(0.4)
UNKNOWN	4437	822,496(2%)	37.4(0.2)	8.1(0.1)	26.8(0.4)	31.8(0.3)	37.5(0.3)	43.2(0.2)	47.8(0.2)
TYPE OF SCHOOL									
PUBLIC	8929	1,628,111(1%)	37.9(0.2)	8.4(0.1)	26.8(0.3)	32.0(0.3)	38.1(0.3)	43.8(0.2)	48.7(0.2)
NON-PUBLIC	864	184,167(12%)	39.3(0.6)	0.0(0.3)	28.6(1.6)	33.9(0.8)	39.7(0.7)	44.9(0.5)	49.4(0.5)

BEST COPY AVAILABLE

Table 15.44

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups

Mathematics, Grade 3

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	10945	2,018,311(1%)	212.1(0.7)	29.8(0.3)	172.8(1.0)	192.1(0.9)	213.0(0.7)	233.0(1.0)	249.8(0.9)
SEX									
MALE	5588	1,016,660(1%)	212.5(0.8)	30.3(0.4)	172.1(1.1)	192.3(1.2)	213.5(0.9)	233.8(1.2)	250.8(1.2)
FEMALE	5357	1,001,651(1%)	211.7(0.8)	29.1(0.4)	173.3(0.8)	191.6(1.2)	212.6(0.9)	232.1(1.0)	249.0(1.3)
ETHNICITY/RACE									
WHITE	6657	1,449,945(1%)	219.7(0.8)	27.0(0.3)	184.4(1.2)	201.6(1.0)	220.4(0.8)	238.3(0.9)	254.1(0.8)
BLACK	2044	289,851(2%)	187.8(1.5)	26.1(0.6)	154.6(1.6)	169.7(1.2)	187.2(1.7)	205.5(1.5)	221.9(2.4)
HISPANIC	1859	210,708(3%)	194.6(1.7)	27.4(0.6)	159.4(2.2)	175.2(2.1)	194.1(2.0)	214.1(2.0)	230.3(1.7)
OTHER	385	67,806(4%)	207.9(2.5)	28.4(1.6)	171.2(2.1)	188.5(5.0)	207.0(4.7)	227.6(4.4)	245.5(3.6)
AGE									
< MODAL AGE	769	132,770(8%)	210.9(1.8)	29.2(1.3)	171.5(4.0)	191.7(1.5)	212.3(3.1)	232.1(3.1)	247.0(2.6)
= MODAL AGE	8102	1,530,675(1%)	216.2(0.7)	28.6(0.3)	178.3(1.1)	197.0(1.0)	217.2(0.9)	236.0(0.7)	252.6(0.8)
> MODAL AGE	2074	354,865(3%)	195.0(1.0)	28.7(0.5)	158.5(1.2)	175.4(1.3)	194.5(1.3)	214.3(2.4)	233.0(2.7)
REGION									
NORTHEAST	2071	419,077(2%)	213.8(1.1)	29.2(0.6)	175.3(2.2)	194.3(1.4)	214.7(1.8)	234.0(1.4)	250.5(1.2)
SOUTHEAST	2797	452,826(7%)	209.2(1.2)	31.0(0.7)	168.3(1.7)	187.0(1.4)	209.7(1.5)	231.6(1.9)	249.0(2.1)
CENTRAL	2370	565,677(6%)	216.4(1.5)	28.9(0.5)	178.0(2.2)	197.3(1.9)	217.6(1.8)	236.2(1.5)	253.0(1.8)
WEST	3707	580,730(3%)	208.9(1.5)	29.4(0.6)	170.3(1.6)	188.7(1.8)	209.4(1.7)	229.6(2.3)	246.6(2.2)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	691	187,479(19%)	214.6(2.9)	27.8(1.0)	178.5(3.1)	195.2(3.4)	215.7(4.1)	233.5(2.7)	249.1(2.4)
LOW METROPOLITAN	1423	171,333(13%)	185.9(2.2)	26.4(0.7)	152.4(1.5)	167.6(1.7)	185.3(2.2)	203.8(3.7)	220.6(2.3)
HIGH METROPOLITAN	1304	244,368(15%)	228.1(2.2)	27.4(0.8)	192.7(1.8)	209.8(2.2)	228.6(2.5)	247.1(2.9)	262.4(2.7)
BIG CITY	1396	182,206(16%)	205.6(1.8)	29.1(0.6)	167.9(1.6)	184.4(1.9)	205.4(1.6)	226.1(1.9)	243.6(3.0)
URBAN FRINGE	1233	236,558(12%)	216.0(1.7)	27.1(0.7)	181.0(3.1)	198.2(2.8)	216.3(1.9)	234.3(1.9)	251.5(2.3)
MEDIUM CITY	2055	344,818(14%)	211.7(1.8)	29.7(0.6)	171.6(2.5)	191.9(1.9)	213.2(1.8)	233.0(2.1)	248.4(2.2)
SMALL PLACE	2843	651,546(9%)	212.9(1.5)	28.1(0.5)	175.7(2.9)	193.7(1.5)	213.6(1.8)	232.6(1.6)	248.7(1.6)
PARENTAL EDUCATION									
LESS THAN H.S.	473	81,939(5%)	195.3(2.0)	27.2(1.3)	160.2(4.1)	176.1(2.9)	194.8(2.2)	215.0(2.6)	230.7(2.6)
GRADUATED H.S.	1383	258,258(5%)	205.5(1.1)	29.1(0.9)	166.5(1.8)	185.9(2.0)	207.0(1.4)	226.5(1.3)	241.8(2.7)
SOME EDUC AFTER H.S.	572	108,823(5%)	217.8(1.9)	30.2(1.6)	176.1(3.1)	197.8(3.9)	220.8(3.9)	239.2(2.5)	254.1(2.2)
GRADUATED COLLEGE	3379	630,422(3%)	221.3(0.8)	29.0(0.6)	182.6(1.7)	202.8(1.5)	222.8(1.0)	241.5(0.8)	257.4(1.0)
UNKNOWN	4967	912,307(2%)	208.9(0.7)	28.6(0.3)	171.7(1.2)	189.4(1.0)	209.4(0.8)	228.8(1.0)	245.4(1.5)
TYPE OF SCHOOL									
PUBLIC	9975	1,812,106(1%)	211.6(0.7)	29.8(0.3)	172.4(0.7)	191.4(0.8)	212.5(0.8)	232.5(1.0)	249.5(1.1)
NON-PUBLIC	970	206,205(12%)	216.6(2.8)	0.0(1.4)	176.7(5.2)	197.6(4.9)	218.2(4.2)	236.5(1.8)	252.6(2.6)

Table 15.45

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups

Science, Grade 3

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	11046	2,028,061(1%)	212.1(0.8)	35.8(0.4)	164.9(1.0)	187.9(1.1)	213.2(1.0)	237.8(1.1)	257.6(0.8)
SEX									
MALE	5570	1,009,291(1%)	212.0(0.9)	[illegible](0.4)	163.3(1.5)	187.1(1.3)	212.8(1.2)	238.6(1.3)	258.8(0.9)
FEMALE	5476	1,018,769(2%)	212.2(0.8)	[illegible](0.5)	166.0(1.2)	188.4(1.3)	213.4(1.1)	236.9(1.1)	256.3(1.4)
ETHNICITY/RACE									
WHITE	6705	1,455,828(1%)	222.4(0.9)	31.6(0.4)	181.4(0.9)	201.0(1.7)	223.1(1.0)	244.8(1.2)	262.6(0.9)
BLACK	2034	288,883(1%)	180.0(1.8)	30.8(0.8)	141.2(2.2)	159.0(1.7)	179.7(1.7)	200.5(2.2)	220.0(2.1)
HISPANIC	1911	215,167(3%)	188.8(1.4)	32.1(0.8)	148.0(1.9)	166.9(1.5)	187.9(1.2)	210.3(0.7)	231.0(2.0)
OTHER	396	68,182(5%)	203.0(2.8)	33.9(1.7)	158.2(3.2)	179.9(5.4)	203.0(3.4)	227.7(3.3)	246.8(3.7)
AGE									
< MODAL AGE	743	124,263(8%)	208.8(2.0)	35.3(1.0)	161.1(3.2)	185.5(2.5)	210.3(2.5)	232.9(1.8)	253.0(4.4)
= MODAL AGE	8140	1,535,163(1%)	216.6(0.8)	34.6(0.4)	170.7(1.3)	193.3(1.1)	218.0(1.1)	241.4(1.1)	260.2(1.1)
> MODAL AGE	2163	368,634(3%)	194.6(1.7)	35.3(1.0)	149.8(1.2)	170.4(2.3)	193.7(1.4)	217.9(2.7)	241.4(3.0)
REGION									
NORTHEAST	2078	412,441(2%)	215.1(1.7)	36.2(0.9)	166.3(3.1)	190.7(2.8)	216.6(3.0)	241.4(2.4)	260.5(1.5)
SOUTHEAST	2839	464,166(7%)	208.7(1.7)	35.8(0.9)	161.8(2.4)	183.5(1.4)	209.5(2.2)	234.4(1.8)	254.7(1.9)
CENTRAL	2384	563,545(6%)	217.0(1.4)	35.1(0.7)	170.2(2.9)	193.8(2.1)	218.9(1.9)	242.1(2.3)	260.8(2.0)
WEST	3745	587,908(2%)	208.1(1.6)	35.4(0.8)	161.3(1.7)	184.0(1.6)	208.3(1.9)	233.4(2.3)	254.1(1.6)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	691	184,173(19%)	216.5(3.6)	34.0(1.7)	171.9(5.9)	193.0(4.3)	216.7(4.5)	240.4(4.5)	259.6(3.6)
LOW METROPOLITAN	1451	175,586(13%)	173.8(2.4)	30.5(1.2)	134.9(2.4)	153.0(1.6)	172.8(2.7)	194.6(2.4)	213.2(3.9)
HIGH METROPOLITAN	1319	249,837(16%)	230.5(2.7)	31.4(1.4)	188.8(5.8)	209.5(3.1)	232.2(2.7)	252.4(2.6)	269.6(2.7)
BIG CITY	1441	190,086(16%)	202.5(2.1)	33.3(1.1)	160.0(3.6)	179.6(1.9)	202.3(2.1)	225.1(1.7)	245.6(1.6)
URBAN FRINGE	1215	224,673(13%)	216.3(2.3)	32.3(1.2)	173.8(3.9)	194.6(3.4)	216.6(3.1)	238.9(3.2)	257.3(3.0)
MEDIUM CITY	2098	348,547(15%)	212.1(2.5)	36.1(0.8)	164.8(2.3)	186.2(2.5)	213.3(3.1)	237.8(2.6)	259.0(2.9)
SMALL PLACE	2831	655,157(10%)	215.5(1.7)	32.8(0.6)	173.0(2.9)	193.3(2.6)	216.0(1.7)	238.9(2.3)	257.0(2.3)
PARENTAL EDUCATION									
LESS THAN H.S.	498	88,005(5%)	190.7(1.6)	30.8(1.8)	150.3(4.1)	170.0(3.1)	190.8(2.4)	211.5(3.2)	230.3(5.5)
GRADUATED H.S.	1366	253,903(6%)	204.3(1.3)	34.1(1.0)	159.6(3.1)	181.7(1.9)	205.3(1.4)	228.6(3.1)	248.3(2.9)
SOME EDUC AFTER H.S.	588	110,858(5%)	220.2(1.8)	36.2(0.9)	171.2(2.1)	197.2(1.8)	223.1(2.1)	246.4(2.5)	263.6(2.0)
GRADUATED COLLEGE	3442	643,297(3%)	224.4(1.1)	34.5(0.6)	178.4(1.3)	201.9(1.9)	226.9(1.8)	248.9(1.3)	267.2(1.2)
UNKNOWN	4977	904,920(2%)	207.5(0.9)	34.6(0.4)	162.0(1.4)	183.7(1.1)	208.7(1.1)	232.1(1.0)	252.0(0.9)
TYPE OF SCHOOL									
PUBLIC	10066	1,822,381(1%)	211.7(0.8)	36.1(0.3)	164.2(1.1)	187.2(0.8)	212.6(1.0)	237.6(1.1)	257.5(0.9)
NON-PUBLIC	980	205,680(12%)	215.8(2.7)	0.0(1.2)	172.1(3.9)	194.0(3.6)	217.1(2.6)	238.9(4.1)	257.9(2.8)

BEST COPY AVAILABLE

Table 15.46

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups

Reading, Grade 7

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	9513	1,246,019(1%)	48.8(0.1)	7.9(0.1)	38.4(0.3)	43.2(0.2)	49.0(0.2)	54.5(0.2)	58.9(0.2)
SEX									
MALE	4825	643,531(1%)	47.5(0.2)	7.9(0.1)	37.0(0.3)	41.7(0.2)	47.5(0.2)	53.3(0.3)	57.8(0.3)
FEMALE	4688	602,488(1%)	50.2(0.1)	7.6(0.1)	40.3(0.2)	45.0(0.2)	50.4(0.2)	55.5(0.1)	59.9(0.2)
ETHNICITY/RACE									
WHITE	5582	881,375(1%)	50.3(0.2)	7.5(0.1)	40.2(0.2)	45.0(0.2)	50.6(0.2)	55.6(0.1)	59.8(0.2)
BLACK	1988	186,850(2%)	45.2(0.3)	7.1(0.1)	36.2(0.4)	40.2(0.3)	45.0(0.3)	50.1(0.4)	54.6(0.3)
HISPANIC	1605	131,095(2%)	44.4(0.4)	7.7(0.2)	34.5(0.7)	38.9(0.5)	44.1(0.7)	49.9(0.5)	54.6(0.5)
OTHER	338	46,697(6%)	48.6(0.9)	8.3(0.7)	38.3(2.0)	42.9(1.5)	48.1(1.5)	54.1(1.4)	59.2(3.8)
AGE									
< MODAL AGE	713	107,051(7%)	51.2(0.5)	7.8(0.3)	40.8(0.7)	45.5(0.8)	51.6(0.6)	56.4(0.6)	61.1(0.9)
= MODAL AGE	6638	835,431(1%)	50.1(0.1)	7.5(0.1)	40.2(0.2)	44.9(0.2)	50.3(0.2)	55.4(0.1)	59.6(0.2)
> MODAL AGE	2162	303,535(3%)	44.4(0.2)	7.4(0.2)	35.1(0.4)	39.2(0.3)	44.2(0.4)	49.5(0.3)	54.3(0.4)
REGION									
NORTHEAST	1627	257,825(2%)	50.5(0.4)	7.9(0.2)	40.0(0.7)	44.9(0.5)	51.0(0.3)	56.1(0.6)	60.6(0.4)
SOUTHEAST	2629	284,570(7%)	48.1(0.2)	7.6(0.1)	38.1(0.5)	42.5(0.3)	48.2(0.3)	53.4(0.3)	57.8(0.5)
CENTRAL	2319	335,526(7%)	49.0(0.2)	7.7(0.1)	38.8(0.5)	43.6(0.3)	49.3(0.3)	54.5(0.3)	58.7(0.2)
WEST	2938	368,097(2%)	48.0(0.4)	8.0(0.2)	37.4(0.5)	42.3(0.7)	48.2(0.6)	53.9(0.6)	58.4(0.3)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	460	81,412(23%)!	48.9(0.6)	7.5(0.4)	38.6(0.7)	43.5(0.7)	49.1(0.7)	54.4(0.6)	58.3(1.1)
LOW METROPOLITAN	1089	103,152(21%)!	44.1(0.5)	7.3(0.2)	34.8(0.9)	38.9(0.5)	43.8(0.6)	49.0(0.5)	53.8(0.7)
HIGH METROPOLITAN	831	133,419(19%)	51.8(0.4)	7.5(0.2)	41.4(0.7)	46.8(0.7)	52.2(0.5)	56.9(0.3)	61.3(0.5)
BIG CITY	1453	146,005(15%)	47.5(0.6)	8.0(0.2)	36.9(0.8)	41.9(0.9)	47.6(0.5)	53.2(0.6)	57.9(0.6)
URBAN FRINGE	1342	148,854(16%)	48.3(0.4)	7.7(0.2)	38.4(0.4)	42.9(0.5)	48.2(0.5)	53.7(0.6)	58.4(0.6)
MEDIUM CITY	1600	189,027(14%)	49.0(0.4)	7.7(0.1)	38.9(0.5)	43.6(0.5)	49.2(0.6)	54.6(0.4)	59.0(0.3)
SMALL PLACE	2738	444,147(9%)	49.5(0.2)	7.7(0.1)	39.4(0.4)	44.2(0.4)	49.8(0.2)	55.0(0.3)	59.2(0.4)
PARENTAL EDUCATION									
LESS THAN H.S.	773	93,940(6%)	45.8(0.3)	7.0(0.3)	36.8(0.5)	40.7(0.4)	45.7(0.4)	50.7(0.5)	54.8(0.8)
GRADUATED H.S.	2662	354,369(3%)	47.6(0.2)	7.5(0.1)	37.9(0.3)	42.4(0.4)	47.8(0.3)	52.9(0.4)	57.1(0.3)
SOME EDUC AFTER H.S.	1321	179,733(2%)	50.4(0.3)	7.6(0.2)	40.1(0.7)	45.3(0.4)	50.9(0.3)	55.7(0.3)	59.9(0.5)
GRADUATED COLLEGE	3342	452,980(3%)	50.9(0.2)	7.9(0.1)	40.3(0.1)	45.4(0.3)	51.4(0.3)	56.5(0.3)	60.8(0.3)
UNKNOWN	1295	153,720(4%)	45.6(0.3)	7.4(0.2)	35.8(0.5)	40.4(0.3)	45.6(0.5)	50.8(0.4)	55.2(0.5)
TYPE OF SCHOOL									
PUBLIC	8756	1,104,199(2%)	48.4(0.1)	7.8(0.1)	38.0(0.3)	42.8(0.2)	48.5(0.2)	54.0(0.2)	58.4(0.2)
NON-PUBLIC	757	141,819(15%)	52.2(0.5)	0.0(0.2)	42.2(0.8)	46.8(0.7)	52.6(0.5)	57.2(0.4)	61.4(0.6)

! INTERPRET WITH CAUTION. STANDARD ERRORS ARE POORLY ESTIMATED.

Table 15.47

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups

Mathematics, Grade 7

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	12185	1,596,045(1%)	267.1(0.6)	28.5(0.3)	230.1(1.1)	246.9(0.8)	267.2(0.6)	287.7(0.8)	304.4(0.8)
SEX									
MALE	6144	810,412(1%)	266.6(0.6)	28.7(0.3)	229.8(1.1)	245.9(1.1)	266.1(0.7)	287.1(0.8)	304.6(0.9)
FEMALE	6041	785,632(1%)	267.6(0.7)	28.3(0.4)	230.0(1.6)	247.7(1.1)	268.1(0.7)	288.2(0.9)	304.0(1.0)
ETHNICITY/RACE									
WHITE	7180	1,130,447(1%)	274.0(0.6)	26.4(0.4)	239.2(1.0)	255.6(1.0)	274.5(0.8)	292.8(1.0)	307.7(1.0)
BLACK	2526	239,023(2%)	245.4(0.8)	23.4(0.4)	215.4(1.2)	229.4(0.8)	245.0(0.9)	260.9(1.3)	275.8(1.1)
HISPANIC	2027	166,266(1%)	251.3(1.1)	25.2(0.5)	220.5(1.5)	233.4(1.1)	249.8(1.1)	267.8(1.5)	285.5(1.5)
OTHER	452	60,307(4%)	269.0(7.2)	33.4(2.8)	225.9(10.4)	244.3(9.2)	266.6(8.0)	295.8(5.0)	314.6(2.7)
AGE									
< MODAL AGE	911	134,283(7%)	274.1(1.3)	27.3(0.7)	238.8(1.7)	254.8(2.5)	273.8(2.3)	294.1(3.0)	310.0(1.9)
= MODAL AGE	8462	1,063,563(1%)	272.9(0.5)	26.8(0.3)	237.7(0.7)	254.1(0.8)	273.3(0.6)	292.0(0.6)	307.3(0.9)
> MODAL AGE	2812	398,199(2%)	249.3(0.8)	25.9(0.5)	217.0(1.0)	231.3(0.8)	247.9(0.9)	266.0(1.2)	283.9(2.8)
REGION									
NORTHEAST	2074	331,451(2%)	275.3(1.2)	27.5(0.4)	238.6(0.7)	256.3(0.9)	276.1(1.9)	295.1(0.9)	310.6(1.5)
SOUTHEAST	3393	365,521(7%)	261.3(1.3)	28.6(0.7)	224.7(0.9)	240.9(1.2)	260.8(1.3)	281.0(1.7)	298.7(1.8)
CENTRAL	2943	426,005(7%)	270.6(1.2)	27.9(0.8)	234.3(1.4)	250.8(2.4)	271.2(1.7)	291.0(1.2)	306.3(1.5)
WEST	3775	473,065(3%)	262.8(1.3)	28.0(0.5)	226.9(2.0)	242.5(1.7)	262.0(1.9)	282.5(1.2)	300.3(1.0)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	614	104,851(23%)!	265.6(3.4)	27.9(1.2)	229.0(7.2)	246.2(3.8)	266.8(2.2)	285.3(3.0)	301.8(3.0)
LOW METROPOLITAN	1340	127,923(21%)!	246.4(2.2)	25.1(0.9)	215.3(1.7)	229.3(2.0)	245.3(2.2)	262.3(2.6)	278.7(4.1)
HIGH METROPOLITAN	1052	164,856(20%)	281.9(1.9)	25.8(0.9)	247.0(2.2)	264.3(2.8)	283.3(2.2)	300.5(2.1)	314.5(1.8)
BIG CITY	1914	190,213(14%)	261.8(1.9)	27.7(0.7)	226.6(2.9)	242.0(2.6)	261.0(2.7)	281.6(2.7)	299.2(2.3)
URBAN FRINGE	1725	192,152(16%)	266.4(1.9)	27.1(0.7)	231.0(2.1)	246.7(1.7)	265.7(3.1)	285.6(3.5)	302.6(1.8)
MEDIUM CITY	2030	241,476(14%)	267.7(1.4)	28.2(0.5)	230.7(2.3)	248.6(2.0)	268.2(1.8)	287.4(1.7)	303.6(1.5)
SMALL PLACE	3510	574,571(9%)	269.6(1.3)	27.9(0.6)	232.7(1.3)	249.7(1.7)	269.9(1.3)	289.5(1.3)	305.7(1.3)
PARENTAL EDUCATION									
LESS THAN H.S.	1031	125,341(4%)	249.4(0.8)	23.8(0.7)	219.0(2.5)	233.7(1.4)	249.4(1.0)	265.0(1.2)	280.8(1.1)
GRADUATED H.S.	3358	448,039(3%)	260.5(0.6)	25.6(0.4)	227.7(1.7)	242.3(0.6)	260.1(0.9)	278.4(1.3)	294.6(1.3)
SOME EDUC AFTER H.S.	1696	231.446(3%)	275.0(0.7)	25.2(0.6)	242.2(1.6)	257.7(1.2)	275.7(0.7)	292.8(1.3)	306.6(1.1)
GRADUATED COLLEGE	4275	580,292(3%)	278.5(0.9)	28.0(0.4)	240.7(1.2)	259.5(1.1)	280.2(1.0)	299.1(1.1)	313.6(0.9)
UNKNOWN	1664	196,041(4%)	251.4(0.9)	25.3(0.6)	219.3(1.7)	233.3(1.4)	250.9(1.5)	269.3(1.4)	284.4(1.4)
TYPE OF SCHOOL									
PUBLIC	11247	1,424,823(2%)	265.6(0.5)	28.4(0.3)	229.1(1.1)	245.3(0.7)	265.4(0.6)	285.9(0.8)	303.0(0.6)
NON-PUBLIC	938	171,222(15%)	279.8(2.5)	0.0(1.5)	245.1(3.1)	262.8(4.6)	281.5(1.6)	298.3(1.9)	312.1(1.8)

! INTERPRET WITH CAUTION. STANDARD ERRORS ARE POORLY ESTIMATED.

Table 15.48

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups

Science, Grade 7

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	12142	1,590,825(1%)	248.7(0.7)	34.4(0.4)	203.0(1.2)	224.6(0.8)	250.5(0.9)	273.7(0.9)	292.3(0.7)
SEX									
MALE	6149	812,616(1%)	252.3(0.8)	34.7(0.5)	206.2(1.4)	227.1(1.0)	253.3(0.9)	277.8(1.0)	297.3(0.9)
FEMALE	5993	778,208(1%)	244.9(0.7)	33.6(0.6)	199.3(1.2)	221.5(1.0)	247.2(1.0)	269.6(0.9)	287.2(1.0)
ETHNICITY/RACE									
WHITE	7213	1,132,764(1%)	259.3(0.7)	29.6(0.4)	219.8(0.8)	239.4(0.9)	260.6(0.8)	280.2(0.8)	296.6(0.9)
BLACK	2495	236,338(1%)	216.8(1.3)	28.8(0.5)	180.4(1.1)	197.4(1.6)	216.1(1.6)	235.9(1.8)	254.4(1.7)
HISPANIC	1998	162,480(1%)	222.0(1.4)	28.5(0.7)	186.5(2.7)	202.0(2.1)	221.0(2.0)	241.1(1.7)	259.6(1.9)
OTHER	436	59,241(4%)	244.4(7.4)	36.8(2.9)	198.4(5.9)	218.3(7.7)	242.7(8.5)	270.5(6.6)	295.4(6.7)
AGE									
< MODAL AGE	923	133,753(7%)	257.0(1.4)	31.5(1.2)	213.7(1.3)	236.2(2.2)	258.8(2.1)	279.1(3.6)	296.8(1.4)
= MODAL AGE	8473	1,068,670(1%)	255.2(0.7)	32.3(0.4)	211.6(1.0)	233.3(0.9)	257.2(0.8)	278.5(0.9)	295.6(0.6)
> MODAL AGE	2746	388,401(3%)	227.8(0.9)	32.5(0.7)	186.6(2.2)	205.5(1.1)	226.8(1.2)	250.1(1.2)	270.3(1.7)
REGION									
NORTHEAST	2091	334,665(2%)	255.4(1.4)	33.0(0.7)	210.6(2.2)	233.7(1.9)	257.5(1.6)	279.1(1.1)	296.7(1.8)
SOUTHEAST	3388	366,745(6%)	242.8(1.6)	34.8(0.6)	196.4(2.9)	218.2(1.6)	243.2(1.7)	268.0(1.8)	288.1(2.3)
CENTRAL	2952	425,237(7%)	255.1(1.5)	33.0(0.8)	210.9(2.6)	232.6(2.3)	256.9(2.1)	279.3(1.4)	296.2(1.1)
WEST	3711	464,177(2%)	242.5(1.7)	34.4(0.9)	197.9(2.3)	217.1(2.4)	243.2(1.9)	267.4(1.4)	287.3(1.4)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	602	101,010(24%)!	251.9(3.6)	31.7(1.3)	210.9(5.4)	229.3(2.9)	251.7(4.3)	274.4(4.3)	293.1(7.5)
LOW METROPOLITAN	1361	131,087(21%)!	217.0(2.1)	30.5(1.0)	178.4(2.8)	196.5(2.5)	216.0(2.3)	236.3(2.7)	256.5(2.6)
HIGH METROPOLITAN	1066	167,872(19%)	266.9(1.8)	28.7(1.3)	230.3(3.8)	249.3(1.9)	268.1(2.1)	286.6(1.1)	302.4(1.3)
BIG CITY	1895	188,640(14%)	239.3(2.6)	33.3(0.7)	196.5(1.7)	215.3(1.9)	239.0(3.0)	262.9(3.5)	283.6(3.1)
URBAN FRINGE	1686	184,488(16%)	245.4(2.8)	33.2(0.8)	202.2(4.1)	221.2(4.0)	245.9(4.2)	269.1(2.4)	289.0(3.0)
MEDIUM CITY	2093	250,917(14%)	249.5(2.1)	33.9(1.2)	204.0(4.8)	225.8(3.6)	252.0(2.0)	274.1(1.5)	292.0(3.1)
SMALL PLACE	3439	566,808(9%)	253.8(1.8)	32.5(1.1)	210.3(3.3)	231.8(2.4)	255.3(1.4)	277.3(1.9)	294.8(1.5)
PARENTAL EDUCATION									
LESS THAN H.S.	1027	126,669(5%)	224.3(1.1)	30.2(1.2)	185.3(2.6)	203.5(2.2)	224.6(1.5)	245.4(1.5)	262.8(1.7)
GRADUATED H.S.	3370	450,090(3%)	240.8(0.8)	30.9(0.6)	200.0(1.4)	219.5(1.1)	241.6(1.2)	262.9(0.9)	280.3(1.2)
SOME EDUC AFTER H.S.	1725	237,056(2%)	258.9(1.0)	29.4(0.7)	218.7(1.6)	240.2(2.2)	260.6(1.5)	279.4(0.8)	295.5(1.5)
GRADUATED COLLEGE	4256	573,409(3%)	262.9(0.9)	32.5(0.5)	217.8(2.0)	242.2(1.2)	266.2(1.1)	286.2(1.2)	302.4(0.8)
UNKNOWN	1606	189,193(4%)	228.8(1.4)	31.9(1.0)	187.9(3.4)	206.9(2.4)	227.6(1.5)	250.6(2.7)	271.3(3.6)
TYPE OF SCHOOL									
PUBLIC	11195	1,418,581(2%)	246.8(0.7)	34.5(0.4)	201.2(1.3)	222.4(1.1)	248.0(0.8)	272.1(0.8)	291.0(0.6)
NON-PUBLIC	947	172,243(15%)	263.6(2.6)	0.0(1.5)	223.4(7.4)	246.2(3.3)	264.9(3.0)	283.7(1.9)	300.0(6.3)

! INTERPRET WITH CAUTION. STANDARD ERRORS ARE POORLY ESTIMATED.

Table 15.49

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups
Reading, Grade 11

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	16510	1,838,151(0%)	56.0(0.2)	9.6(0.1)	43.2(0.3)	49.7(0.2)	56.4(0.2)	62.7(0.3)	68.1(0.3)
SEX									
MALE	8202	829,034(2%)	54.4(0.3)	9.8(0.1)	41.2(0.3)	47.6(0.4)	54.7(0.4)	61.3(0.3)	66.8(0.5)
FEMALE	8308	809,117(1%)	57.7(0.2)	9.0(0.1)	45.9(0.3)	51.8(0.2)	57.9(0.2)	63.9(0.3)	69.2(0.3)
ETHNICITY/RACE									
WHITE	11653	1,246,798(0%)	57.3(0.2)	9.3(0.1)	44.9(0.3)	51.3(0.3)	57.8(0.2)	63.7(0.3)	68.9(0.3)
BLACK	2741	220,220(2%)	51.3(0.3)	8.7(0.2)	39.8(0.3)	45.4(0.4)	51.4(0.3)	57.2(0.4)	62.5(0.8)
HISPANIC	1645	118,501(2%)	51.3(0.3)	9.3(0.2)	39.0(0.4)	44.8(0.6)	51.6(0.4)	57.6(0.5)	63.1(0.7)
OTHER	471	52,630(5%)	56.1(1.4)	10.3(0.6)	42.6(1.5)	49.0(1.2)	56.3(2.2)	63.5(1.8)	69.0(2.2)
AGE									
< MODAL AGE	1703	187,073(5%)	58.0(0.4)	9.0(0.2)	46.3(0.7)	52.3(0.6)	58.2(0.5)	64.1(0.7)	69.5(0.9)
= MODAL AGE	12393	1,165,375(1%)	57.1(0.2)	9.2(0.1)	44.9(0.3)	51.0(0.2)	57.5(0.2)	63.5(0.3)	68.7(0.3)
> MODAL AGE	2414	285,702(3%)	50.2(0.3)	9.1(0.2)	38.2(0.5)	43.6(0.5)	50.3(0.4)	56.5(0.5)	62.2(0.7)
REGION									
NORTHEAST	3386	394,733(1%)	57.3(0.5)	9.4(0.2)	44.6(0.9)	51.3(0.6)	57.7(0.4)	63.8(0.5)	69.1(0.7)
SOUTHEAST	4123	338,817(7%)	54.7(0.3)	9.8(0.1)	41.5(0.5)	48.0(0.4)	54.8(0.3)	61.5(0.4)	67.3(0.4)
CENTRAL	4209	468,503(5%)	56.4(0.5)	9.4(0.2)	43.9(0.8)	50.3(0.5)	56.8(0.6)	62.8(0.5)	68.3(0.5)
WEST	4792	436,097(2%)	55.4(0.4)	9.5(0.2)	42.8(0.4)	49.0(0.4)	55.8(0.5)	62.1(0.5)	67.3(0.8)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	703	72,000(35%)!	55.2(0.8)	9.4(0.3)	42.3(0.9)	49.1(1.2)	55.7(0.7)	61.5(0.5)	66.8(0.6)
LOW METROPOLITAN	1091	88,769(21%)!	51.1(0.6)	8.9(0.3)	39.5(0.7)	45.1(0.8)	51.2(0.5)	57.1(0.7)	62.4(0.8)
HIGH METROPOLITAN	1962	224,409(16%)	59.2(0.5)	9.2(0.2)	46.9(0.7)	53.3(0.6)	59.7(0.6)	65.5(0.6)	70.7(0.7)
BIG CITY	1696	128,129(20%)	53.9(0.6)	9.4(0.2)	41.3(0.8)	47.5(0.8)	54.2(0.7)	60.4(0.7)	66.0(1.1)
URBAN FRINGE	2252	253,130(14%)	56.1(0.5)	9.4(0.2)	43.4(0.6)	50.0(0.6)	56.5(0.5)	62.6(0.5)	68.0(0.7)
MEDIUM CITY	3279	257,341(14%)	56.1(0.5)	9.7(0.2)	43.0(0.7)	49.8(0.6)	56.6(0.5)	62.8(0.6)	68.3(0.5)
SMALL PLACE	5527	614,372(9%)	56.0(0.3)	9.4(0.1)	43.3(0.4)	49.8(0.3)	56.4(0.3)	62.6(0.2)	67.8(0.3)
PARENTAL EDUCATION									
LESS THAN H.S.	1461	130,349(5%)	51.6(0.3)	8.8(0.2)	39.9(0.5)	45.4(0.4)	51.9(0.3)	57.6(0.5)	62.7(0.7)
GRADUATED H.S.	4546	441,638(3%)	53.4(0.2)	9.1(0.1)	41.2(0.3)	47.3(0.4)	53.8(0.3)	59.6(0.3)	65.0(0.3)
SOME EDUC AFTER H.S.	3649	359,284(2%)	56.9(0.2)	8.9(0.1)	45.2(0.3)	51.2(0.2)	57.3(0.3)	63.0(0.3)	68.0(0.4)
GRADUATED COLLEGE	6189	642,424(3%)	58.9(0.3)	9.2(0.1)	46.6(0.3)	52.9(0.3)	59.3(0.3)	65.3(0.2)	70.4(0.3)
UNKNOWN	582	54,630(5%)	48.8(0.5)	8.9(0.3)	37.2(1.1)	42.1(0.7)	48.9(0.9)	54.9(0.9)	60.5(0.7)
TYPE OF SCHOOL									
PUBLIC	15169	1,488,089(1%)	55.6(0.2)	9.5(0.1)	42.8(0.3)	49.2(0.2)	56.0(0.3)	62.2(0.2)	67.7(0.3)
NON-PUBLIC	1341	150,061(14%)	60.1(0.5)	8.6(0.2)	48.9(0.6)	54.3(0.6)	60.3(0.5)	66.0(0.5)	71.0(0.5)
HIGH SCHOOL PROGRAM									
GENERAL	6313	618,054(3%)	52.7(0.2)	8.8(0.1)	41.0(0.3)	46.8(0.4)	53.0(0.3)	58.7(0.3)	63.8(0.3)
ACADEMIC/COLLEGE PREP	8336	842,368(2%)	59.6(0.2)	8.8(0.1)	48.0(0.3)	54.0(0.2)	59.9(0.2)	65.6(0.2)	70.5(0.3)
VOCATIONAL/TECHNICAL	1717	162,780(5%)	50.8(0.3)	7.0(3.9)	39.1(0.8)	44.7(0.5)	51.1(0.3)	56.9(0.6)	61.9(0.3)

! INTERPRET WITH CAUTION. STANDARD ERRORS ARE POORLY ESTIMATED.

Table 15.50

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups
Mathematics, Grade 11

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	11850	1,190,734(1%)	304.0(0.7)	30.0(0.4)	264.7(0.8)	282.5(0.7)	304.1(0.8)	325.7(1.0)	343.1(1.2)
SEX									
MALE	5840	599,641(2%)	306.1(1.0)	30.8(0.5)	265.2(1.1)	283.8(1.0)	306.2(1.1)	328.5(1.1)	346.0(1.5)
FEMALE	6010	591,092(2%)	301.8(0.8)	28.9(0.4)	264.1(1.0)	281.2(0.7)	302.0(1.0)	322.8(1.1)	339.7(1.1)
ETHNICITY/RACE									
WHITE	8389	904,250(1%)	309.4(0.7)	27.4(0.3)	273.1(0.7)	290.2(0.9)	309.8(1.0)	329.2(0.8)	344.9(0.9)
BLACK	1918	156,313(2%)	279.2(1.2)	26.2(0.8)	246.6(1.5)	260.4(1.0)	277.5(1.4)	296.5(1.4)	314.4(1.3)
HISPANIC	1185	88,829(3%)	285.6(1.5)	27.1(0.7)	252.1(1.4)	266.1(1.6)	283.5(1.9)	303.1(1.5)	322.5(1.9)
OTHER	358	41,341(4%)	317.1(6.4)	37.2(1.2)	270.0(5.1)	287.1(6.5)	315.2(11.3)	348.3(7.5)	365.9(4.2)
AGE									
< MODAL AGE	1157	125,937(6%)	311.4(1.8)	28.8(0.9)	274.4(1.9)	291.3(1.4)	311.6(2.6)	331.8(1.7)	349.2(4.0)
= MODAL AGE	8850	842,301(1%)	308.2(0.7)	28.3(0.3)	271.1(0.9)	288.2(0.7)	308.3(0.9)	328.5(0.9)	344.7(0.9)
> MODAL AGE	1843	222,495(4%)	283.7(1.0)	28.2(0.6)	249.4(1.2)	263.5(0.7)	281.1(1.1)	301.9(1.3)	323.0(2.7)
REGION									
NORTHEAST	2479	293,102(2%)	309.6(1.5)	30.5(0.7)	269.0(1.4)	287.8(1.6)	310.7(2.0)	332.0(2.4)	348.6(2.3)
SOUTHEAST	2972	247,137(6%)	297.2(1.1)	29.8(1.0)	258.3(1.8)	275.7(1.1)	297.0(1.1)	319.0(1.3)	336.7(2.4)
CENTRAL	2937	328,200(5%)	305.6(1.2)	28.4(0.6)	268.0(1.4)	285.6(1.5)	306.3(1.8)	326.4(1.3)	342.3(1.6)
WEST	3462	322,294(2%)	302.3(2.0)	30.0(1.0)	263.9(1.2)	280.9(1.5)	301.3(1.6)	323.1(2.6)	342.2(4.3)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	497	52,361(34%)!	299.0(3.4)	27.8(1.7)	261.9(8.6)	279.3(4.3)	299.5(3.0)	319.6(2.4)	335.1(4.2)
LOW METROPOLITAN	796	64,847(20%)	279.9(3.3)	27.7(1.9)	245.9(2.2)	260.3(2.2)	277.8(2.9)	297.7(3.5)	317.5(5.9)
HIGH METROPOLITAN	1395	160,362(16%)	320.9(2.1)	29.0(0.7)	282.4(2.7)	300.8(2.9)	321.9(1.8)	342.3(2.9)	358.1(2.3)
BIG CITY	1227	93,680(20%)	294.2(2.3)	28.1(0.8)	258.9(2.0)	274.1(1.8)	292.6(2.8)	313.6(3.8)	332.9(2.6)
URBAN FRINGE	1623	184,134(14%)	303.5(1.6)	28.0(0.7)	267.7(1.7)	283.9(3.9)	303.5(1.8)	323.5(1.9)	340.6(1.8)
MEDIUM CITY	2363	189,034(14%)	304.7(1.8)	30.1(0.7)	265.0(2.8)	282.6(2.1)	304.8(1.9)	327.4(2.3)	344.2(1.5)
SMALL PLACE	3949	446,313(9%)	303.8(1.1)	28.4(0.4)	266.2(1.5)	283.6(1.6)	304.3(1.6)	324.6(1.2)	340.6(1.3)
PARENTAL EDUCATION									
LESS THAN H.S.	1097	99,782(5%)	284.5(1.3)	26.4(1.0)	251.9(1.6)	265.6(2.5)	282.8(1.6)	301.6(2.1)	320.0(2.0)
GRADUATED H.S.	3263	323,606(3%)	293.8(0.7)	26.9(0.4)	259.7(1.0)	275.0(0.8)	293.2(0.8)	311.9(0.6)	329.7(1.4)
SOME EDUC AFTER H.S.	2609	259,825(3%)	306.6(0.8)	27.2(0.5)	270.4(1.5)	287.8(1.0)	307.6(0.7)	326.2(1.3)	341.3(0.9)
GRADUATED COLLEGE	4415	463,731(4%)	316.0(0.9)	28.4(0.5)	278.2(1.1)	296.7(1.1)	317.6(1.2)	336.4(1.4)	351.6(1.5)
UNKNOWN	400	36,893(6%)	278.8(1.2)	27.7(1.1)	244.7(1.6)	259.2(1.7)	275.9(2.6)	297.7(3.1)	315.2(2.3)
TYPE OF SCHOOL									
PUBLIC	10866	1,078,031(2%)	302.7(0.7)	30.1(0.4)	263.5(0.8)	281.0(0.6)	302.5(0.8)	324.5(1.1)	342.2(1.2)
NON-PUBLIC	984	112,703(15%)	315.8(2.3)	26.2(0.8)	282.0(4.4)	297.4(1.9)	316.3(3.8)	334.8(3.0)	349.5(4.3)
HIGH SCHOOL PROGRAM									
GENERAL	4490	443,025(3%)	289.3(0.7)	25.3(0.4)	256.8(0.7)	271.7(0.7)	289.0(1.0)	306.5(1.3)	322.4(1.1)
ACADEMIC/COLLEGE PREP	6037	619,158(2%)	318.8(0.8)	26.2(0.4)	284.0(1.0)	301.3(1.0)	320.3(1.0)	337.2(1.1)	351.5(1.3)
VOCATIONAL/TECHNICAL	1203	116,234(7%)	284.0(1.1)	18.8(10.5)	253.7(1.7)	267.4(1.2)	283.7(1.4)	300.5(1.9)	314.6(1.8)

! INTERPRET WITH CAUTION. STANDARD ERRORS ARE POORLY ESTIMATED.

Table 15.51

Weighted Means, Standard Deviations (N-1), and Percentiles for Reporting Groups
Science, Grade 11

	N	WEIGHTED N	MEAN	ST. DEV.	- 10 -	- 25 -	- 50 -	- 75 -	- 90 -
-- TOTAL --	11744	1,174,393(1%)	291.0(1.0)	37.9(0.3)	241.4(0.9)	264.7(1.0)	291.5(1.1)	318.2(1.4)	340.5(1.1)
SEX									
MALE	5755	581,792(2%)	298.7(1.1)	38.5(0.5)	247.3(1.4)	271.6(1.2)	299.8(1.2)	327.1(1.3)	348.6(1.4)
FEMALE	5989	592,601(2%)	283.5(1.0)	35.8(0.4)	236.3(0.9)	259.1(1.2)	284.3(1.3)	309.3(1.3)	329.7(1.2)
ETHNICITY/RACE									
WHITE	8291	892,375(1%)	300.1(0.9)	33.3(0.3)	256.9(1.3)	276.5(1.0)	300.1(1.1)	323.8(1.2)	343.9(1.2)
BLACK	1933	156,662(2%)	253.1(1.5)	32.0(1.0)	212.8(1.7)	231.0(1.6)	251.4(1.4)	274.1(2.3)	296.0(5.0)
HISPANIC	1159	85,196(3%)	263.8(1.5)	32.6(0.9)	222.9(2.1)	240.9(2.5)	261.8(1.8)	285.8(3.3)	307.0(3.4)
OTHER	361	40,158(4%)	294.6(8.4)	45.8(2.3)	236.4(14.8)	259.3(7.6)	293.3(9.5)	329.3(12.8)	355.8(8.0)
AGE									
< MODAL AGE	1172	127,558(5%)	296.8(2.2)	36.7(0.9)	249.7(3.0)	271.0(2.7)	296.8(3.7)	322.6(3.7)	343.9(2.1)
= MODAL AGE	8878	845,271(1%)	296.1(0.9)	35.8(0.4)	249.2(0.9)	271.3(0.8)	296.8(1.0)	321.6(1.0)	342.8(1.6)
> MODAL AGE	1694	201,564(3%)	265.9(1.5)	37.2(1.0)	220.1(2.3)	239.8(1.5)	263.8(1.5)	289.6(3.6)	317.6(3.5)
REGION									
NORTHEAST	2418	284,011(2%)	297.4(2.2)	38.9(1.0)	245.9(2.0)	270.0(2.5)	298.6(2.3)	326.0(2.4)	347.8(3.4)
SOUTHEAST	2937	244,126(6%)	282.2(1.3)	38.4(0.9)	231.1(2.2)	255.0(1.1)	283.0(2.0)	310.2(2.6)	332.0(1.8)
CENTRAL	2973	330,083(5%)	293.5(1.6)	35.5(0.6)	247.3(2.4)	268.9(2.3)	294.5(1.9)	318.8(1.7)	338.8(2.3)
WEST	3416	316,172(2%)	289.5(2.5)	37.7(0.7)	240.8(1.8)	263.1(1.8)	288.7(2.4)	316.4(3.4)	339.7(3.3)
SIZE/TYPE OF COMMUNITY									
EXTREME RURAL	484	50,516(34%)!	286.5(5.0)	36.5(2.2)	238.2(4.8)	261.3(6.3)	287.7(5.7)	313.4(6.3)	332.6(7.6)
LOW METROPOLITAN	751	61,016(21%)!	256.3(3.6)	34.7(2.0)	213.7(2.3)	232.4(2.9)	254.8(4.3)	277.6(4.5)	303.3(8.6)
HIGH METROPOLITAN	1380	161,126(17%)	313.0(2.5)	35.2(0.9)	266.0(3.2)	288.4(3.1)	314.1(3.4)	338.3(2.0)	357.9(4.2)
BIG CITY	1273	96,509(21%)!	275.6(3.1)	36.2(0.9)	230.6(4.4)	249.9(4.2)	273.9(3.3)	300.3(4.2)	324.8(4.3)
URBAN FRINGE	1643	185,031(14%)	291.3(2.6)	34.7(1.3)	246.3(4.6)	267.3(3.8)	291.2(2.6)	315.3(1.5)	336.4(1.8)
MEDIUM CITY	2352	186,945(14%)	290.7(2.4)	39.1(0.9)	238.2(2.2)	262.6(2.6)	291.9(2.4)	319.6(2.5)	341.2(2.2)
SMALL PLACE	3861	433,247(8%)	291.8(1.5)	35.2(0.4)	245.3(1.8)	267.6(1.6)	292.2(1.5)	316.6(2.1)	338.0(1.8)
PARENTAL EDUCATION									
LESS THAN H.S.	1121	103,587(5%)	264.1(1.6)	32.6(1.1)	223.6(2.5)	242.1(2.4)	263.2(1.5)	285.0(1.9)	306.6(1.6)
GRADUATED H.S.	3297	325,830(3%)	277.4(1.0)	34.2(0.6)	233.6(1.2)	254.4(1.5)	277.4(0.9)	300.8(1.4)	322.0(2.1)
SOME EDUC AFTER H.S.	2539	250,394(2%)	295.2(1.0)	33.8(0.5)	251.3(2.3)	272.3(1.2)	295.9(1.5)	318.7(2.3)	338.6(1.2)
GRADUATED COLLEGE	4323	450,720(4%)	307.8(1.2)	35.0(0.5)	261.1(2.2)	284.3(1.6)	309.8(1.3)	332.9(1.3)	351.7(1.3)
UNKNOWN	422	39,301(8%)	258.8(2.8)	34.8(1.4)	214.5(3.2)	235.1(5.3)	257.0(4.0)	281.6(3.6)	306.1(3.2)
TYPE OF SCHOOL									
PUBLIC	10754	1,062,716(1%)	289.6(0.9)	38.0(0.4)	239.8(0.9)	263.0(0.9)	289.9(1.0)	316.9(1.5)	339.2(0.9)
NON-PUBLIC	990	111,676(14%)	304.7(3.2)	34.0(1.1)	261.1(2.8)	281.1(4.2)	305.0(3.8)	328.3(3.5)	349.6(4.1)
HIGH SCHOOL PROGRAM									
GENERAL	4552	452,757(2%)	273.0(1.0)	33.0(0.6)	230.8(2.3)	250.4(1.3)	272.9(1.4)	295.2(1.6)	315.4(1.8)
ACADEMIC/COLLEGE PREP	5893	595,351(2%)	309.6(1.1)	33.1(0.4)	266.1(1.6)	288.0(1.5)	311.4(1.3)	333.0(1.4)	350.7(1.6)
VOCATIONAL/TECHNICAL	1194	115,450(6%)	269.3(1.4)	24.5(13.7)	228.8(2.6)	248.9(1.2)	269.5(1.1)	290.8(1.6)	307.9(2.9)

! INTERPRET WITH CAUTION. STANDARD ERRORS ARE POORLY ESTIMATED.

Table 15.52

Weighted Response Percentages and General Reading Proficiency Means, Grade 3

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	9793	1,812,279(1%)	100.0(0.0) 38.0(0.2)	0.0
SEX				
MALE	4934	900,205(1%)	100.0(0.0) 37.2(0.2)	0.0
FEMALE	4859	912,073(1%)	100.0(0.0) 38.8(0.2)	0.0
ETHNICITY/RACE				
WHITE	5920	1,298,526(1%)	100.0(0.0) 39.7(0.2)	0.0
BLACK	1821	259,284(2%)	100.0(0.0) 33.3(0.5)	0.0
HISPANIC	1687	190,787(3%)	100.0(0.0) 33.2(0.3)	0.0
OTHER	365	63,682(4%)	100.0(0.0) 36.1(0.9)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	444	75,738(7%)	100.0(0.0) 34.3(0.5)	0.0
GRADUATED H.S.	1235	230,851(5%)	100.0(0.0) 36.6(0.4)	0.0
SOME EDUC AFTER H.S.	512	97,670(6%)	100.0(0.0) 38.4(0.5)	0.0
GRADUATED COLLEGE	3029	565,470(2%)	100.0(0.0) 40.1(0.3)	0.0
UNKNOWN	4436	822,202(2%)	100.0(0.0) 37.4(0.2)	0.0

Table 15.53

Weighted Response Percentages and General Reading Proficiency Means, Grade 3

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	9793	1,812,279(1%)	49.7(0.7) 37.2(0.2)	50.3(0.7) 38.8(0.2)	0.0
SEX					
MALE	4934	900,205(1%)	100.0(0.0) 37.2(0.2)	0.0(0.0) *****(0.0)	0.0
FEMALE	4859	912,073(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 38.8(0.2)	0.0
ETHNICITY/RACE					
WHITE	5920	1,298,526(1%)	49.8(0.9) 39.2(0.3)	50.2(0.9) 40.3(0.3)	0.0
BLACK	1821	259,284(2%)	46.7(1.3) 31.6(0.5)	53.3(1.3) 34.8(0.5)	0.0
HISPANIC	1687	190,787(3%)	54.0(1.8) 32.0(0.4)	46.0(1.8) 34.5(0.3)	0.0
OTHER	365	63,682(4%)	45.8(3.5) 34.7(0.9)	54.2(3.5) 37.4(1.1)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	444	75,738(7%)	46.7(2.3) 33.1(0.7)	53.3(2.3) 35.4(0.8)	0.0
GRADUATED H.S.	1235	230,851(5%)	51.3(1.5) 35.5(0.5)	48.7(1.5) 37.8(0.5)	0.0
SOME EDUC AFTER H.S.	512	97,670(6%)	55.1(2.0) 37.4(0.8)	44.9(2.0) 39.7(0.9)	0.0
GRADUATED COLLEGE	3029	565,470(2%)	53.2(0.9) 39.2(0.3)	46.8(0.9) 41.2(0.3)	0.0
UNKNOWN	4436	822,202(2%)	46.3(1.3) 36.6(0.3)	53.7(1.3) 38.0(0.3)	0.0

Table 15.54

Weighted Response Percentages and General Reading Proficiency Means, Grade 3

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	9793	1,812,279(1%)	20.5(0.3) 39.1(0.3)	22.8(1.7) 37.2(0.3)	27.8(1.7) 39.2(0.4)	28.9(0.6) 36.8(0.4)	0.0
SEX							
MALE	4934	900,205(1%)	21.0(0.6) 38.5(0.6)	22.1(1.8) 36.1(0.4)	27.9(1.9) 38.3(0.4)	28.9(0.6) 36.0(0.4)	0.0
FEMALE	4859	912,073(1%)	20.0(0.6) 39.7(0.3)	23.6(1.7) 38.1(0.4)	27.6(1.6) 40.0(0.5)	28.8(0.8) 37.7(0.5)	0.0
ETHNICITY/RACE							
WHITE	5920	1,298,526(1%)	22.2(0.3) 40.6(0.3)	20.7(2.2) 39.3(0.4)	31.9(2.1) 40.2(0.4)	25.2(0.4) 38.8(0.4)	0.0
BLACK	1821	259,284(2%)	19.8(0.7) 33.7(1.4)	44.0(0.7) 33.4(0.7)	21.1(2.6) 33.1(0.8)	15.1(2.6) 33.0(0.9)	0.0
HISPANIC	1687	190,787(3%)	13.3(2.2) 33.5(0.7)	11.7(2.3) 31.1(1.0)	12.5(1.8) 34.5(0.9)	62.4(1.2) 33.2(0.3)	0.0
OTHER	365	63,682(4%)	11.6(2.7) 36.8(1.6)	13.6(3.5) 36.4(2.9)	16.3(4.1) 39.2(1.0)	58.5(6.8) 35.1(1.3)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	444	75,738(7%)	17.0(2.2) 35.6(1.0)	33.4(4.3) 34.1(0.5)	25.6(3.5) 35.5(1.4)	24.1(2.5) 32.4(1.0)	0.0
GRADUATED H.S.	1235	230,851(5%)	17.2(1.5) 37.8(0.7)	26.1(2.3) 35.3(0.5)	30.1(2.5) 38.3(0.6)	26.6(1.5) 35.2(0.9)	0.0
SOME EDUC AFTER H.S.	512	97,670(6%)	17.6(2.6) 37.8(1.5)	21.2(2.5) 37.9(1.2)	29.3(3.4) 40.2(0.8)	31.9(2.5) 37.4(0.6)	0.0
GRADUATED COLLEGE	3029	565,470(2%)	23.9(1.3) 41.8(0.4)	22.0(1.8) 38.8(0.5)	27.9(2.1) 40.7(0.5)	26.2(1.3) 39.1(0.5)	0.0
UNKNOWN	4436	822,202(2%)	19.0(0.9) 38.1(0.3)	21.9(1.9) 37.0(0.4)	27.8(1.8) 38.5(0.3)	31.4(1.0) 36.2(0.4)	0.0

Table 15.55

Weighted Response Percentages and General Reading Proficiency Means, Grade 3

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	9793	1,812,279(1%)	71.7(0.4) 39.7(0.2)	14.3(0.2) 33.3(0.5)	10.5(0.3) 33.2(0.3)	1.1(0.2) 37.2(1.2)	2.3(0.2) 35.3(1.0)	0.1(0.0) 42.8(3.6)	0.0
SEX									
MALE	4934	900,205(1%)	71.9(0.6) 39.2(0.3)	13.4(0.4) 31.6(0.5)	11.5(0.5) 32.0(0.4)	1.1(0.2) 34.4(1.8)	2.1(0.2) 34.8(1.0)	0.1(0.0) 36.2(6.9)	0.0
FEMALE	4859	912,073(1%)	71.4(0.6) 40.3(0.3)	15.2(0.5) 34.8(0.5)	9.6(0.5) 34.5(0.3)	1.1(0.2) 40.2(1.5)	2.6(0.4) 35.7(1.3)	0.2(0.1) 44.8(3.5)	0.0
ETHNICITY/RACE									
WHITE	5920	1,298,526(1%)	100.0(0.0) 39.7(0.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	1821	259,284(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 33.3(0.5)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	1687	190,787(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 33.2(0.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	365	63,682(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	31.3(5.0) 37.2(1.2)	65.6(5.4) 35.3(1.0)	3.1(1.0) 42.8(3.6)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	444	75,738(7%)	65.3(2.1) 35.7(0.6)	17.3(1.7) 31.5(0.7)	14.4(1.5) 31.7(1.1)	0.5(0.3) 25.4(9.3)	2.6(0.8) 32.9(1.8)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	1235	230,851(5%)	69.0(1.2) 38.6(0.4)	16.6(1.0) 31.8(0.7)	11.0(0.7) 32.5(0.8)	0.5(0.2) 23.4(2.7)	2.8(0.5) 33.5(2.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	512	97,670(6%)	72.2(2.1) 40.7(0.5)	13.4(1.2) 31.3(1.0)	13.0(1.8) 33.0(1.3)	0.6(0.4) 34.9(5.7)	0.8(0.4) 39.3(3.8)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3029	565,470(2%)	74.9(0.9) 41.9(0.2)	13.6(0.6) 34.7(0.5)	8.3(0.7) 34.2(0.7)	0.9(0.2) 41.5(2.4)	2.1(0.3) 37.1(1.5)	0.2(0.1) 45.0(6.1)	0.0
UNKNOWN	4436	822,202(2%)	71.0(0.7) 38.9(0.3)	13.9(0.5) 33.4(0.6)	11.0(0.6) 33.3(0.4)	1.4(0.3) 37.1(1.6)	2.5(0.5) 35.0(1.5)	0.1(0.0) 41.2(4.9)	0.0

Table 15.56

Weighted Response Percentages and General Reading Proficiency Means, Grade 3

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	9656	1,791,932(1%)	4.2(0.3) 34.3(0.5)	12.9(0.6) 36.6(0.4)	5.5(0.3) 38.4(0.5)	31.6(0.8) 40.1(0.3)	45.9(0.9) 37.4(0.2)	1.1
SEX								
MALE	4861	889,084(1%)	4.0(0.4) 33.1(0.7)	13.3(0.8) 35.5(0.5)	6.1(0.4) 37.4(0.8)	33.8(0.9) 39.2(0.3)	42.8(1.0) 36.6(0.3)	1.2
FEMALE	4795	902,847(2%)	4.5(0.3) 35.4(0.8)	12.5(0.7) 37.8(0.5)	4.9(0.4) 39.7(0.9)	29.3(1.0) 41.2(0.3)	48.9(1.2) 38.0(0.3)	1.0
ETHNICITY/RACE								
WHITE	5851	1,286,842(1%)	3.8(0.3) 35.7(0.6)	12.4(0.7) 38.6(0.4)	5.5(0.4) 40.7(0.5)	32.9(1.0) 41.9(0.2)	45.4(0.9) 38.9(0.3)	0.9
BLACK	1797	255,918(2%)	5.1(0.6) 31.5(0.7)	15.0(1.0) 31.8(0.7)	5.1(0.5) 31.3(1.0)	30.1(1.3) 34.7(0.5)	44.6(1.5) 33.4(0.6)	1.3
HISPANIC	1652	186,908(3%)	5.8(0.6) 31.7(1.1)	13.6(1.1) 32.5(0.8)	6.8(0.8) 33.0(1.3)	25.2(2.1) 34.2(0.7)	48.6(2.4) 33.3(0.4)	2.0
OTHER	356	62,263(5%)	3.7(1.1) 31.7(1.9)	12.3(1.8) 31.8(2.0)	2.2(1.0) 37.4(3.6)	28.5(2.9) 38.8(1.2)	53.3(3.1) 35.9(1.0)	2.2
PARENTAL EDUCATION								
LESS THAN H.S.	444	75,738(7%)	100.0(0.0) 34.3(0.5)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	1235	230,851(5%)	0.0(0.0) *****(0.0)	100.0(0.0) 36.6(0.4)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	512	97,670(6%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 38.4(0.5)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3029	565,470(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 40.1(0.3)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	4436	822,202(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 37.4(0.2)	0.0

Table 15.57

Weighted Response Percentages and General Reading Proficiency Means, Grade 3

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	9639	1,788,730(1%)	40.1(0.8) 35.7(0.2)	31.1(0.5) 38.9(0.3)	28.8(0.8) 40.6(0.2)	1.3
SEX						
MALE	4852	887,266(1%)	38.4(0.9) 34.1(0.3)	30.4(0.6) 38.1(0.4)	31.2(1.1) 40.3(0.3)	1.4
FEMALE	4787	901,463(2%)	41.7(1.0) 37.0(0.2)	31.9(0.8) 39.6(0.4)	26.4(0.9) 40.9(0.3)	1.2
ETHNICITY/RACE						
WHITE	5842	1,285,469(1%)	34.8(0.9) 37.6(0.2)	32.4(0.6) 40.3(0.3)	32.8(1.0) 41.7(0.2)	1.0
BLACK	1795	255,594(2%)	52.3(1.6) 32.4(0.5)	27.8(1.4) 34.0(0.6)	19.9(1.5) 35.0(0.6)	1.4
HISPANIC	1645	185,265(4%)	56.0(2.0) 31.9(0.4)	27.1(1.4) 34.7(0.5)	16.9(1.4) 35.7(0.6)	2.9
OTHER	357	62,402(5%)	51.9(2.6) 35.2(0.9)	30.1(2.6) 37.6(1.9)	18.0(1.7) 36.4(1.4)	2.0
PARENTAL EDUCATION						
LESS THAN H.S.	439	75,074(7%)	55.2(3.2) 32.9(0.5)	26.5(3.1) 36.2(1.1)	18.3(1.5) 36.0(1.2)	0.9
GRADUATED H.S.	1226	228,887(5%)	45.8(1.4) 35.0(0.5)	29.4(1.8) 37.7(0.6)	24.9(1.5) 38.6(0.7)	0.9
SOME EDUC AFTER H.S.	511	97,518(6%)	33.3(2.7) 35.8(0.9)	30.5(2.5) 38.6(0.9)	36.2(2.7) 40.7(0.6)	0.2
GRADUATED COLLEGE	3026	565,038(2%)	26.7(1.3) 37.0(0.5)	34.5(1.0) 40.1(0.3)	38.8(1.3) 42.3(0.2)	0.1
UNKNOWN	4423	820,235(2%)	47.1(1.1) 35.7(0.3)	29.8(0.8) 38.6(0.3)	23.1(1.1) 39.4(0.4)	0.2

Table 15.58

Weighted Response Percentages and General Reading Proficiency Means, Grade 3

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	9668	1,791,501(1%)	31.3(1.1) 39.3(0.3)	34.7(0.7) 39.5(0.2)	34.0(0.9) 35.5(0.2)	1.1
SEX						
MALE	4866	888,590(1%)	28.5(1.2) 38.6(0.4)	35.7(1.1) 38.7(0.3)	35.8(1.1) 34.8(0.2)	1.3
FEMALE	4802	902,912(1%)	34.1(1.2) 39.9(0.3)	33.7(0.7) 40.4(0.3)	32.2(1.1) 36.2(0.3)	1.0
ETHNICITY/RACE						
WHITE	5842	1,284,355(1%)	33.5(1.3) 40.7(0.3)	37.7(1.0) 40.8(0.2)	28.8(1.0) 37.4(0.2)	1.1
BLACK	1797	255,770(2%)	21.9(1.4) 34.3(0.7)	25.0(1.1) 34.4(0.5)	53.1(1.5) 32.5(0.6)	1.4
HISPANIC	1667	188,236(3%)	29.4(2.2) 33.8(0.4)	28.8(1.7) 34.6(0.5)	41.7(2.3) 31.9(0.4)	1.3
OTHER	362	63,141(4%)	31.3(4.0) 37.3(1.1)	29.3(3.6) 37.6(1.3)	39.4(2.7) 34.3(1.3)	0.8
PARENTAL EDUCATION						
LESS THAN H.S.	442	75,431(7%)	28.0(3.5) 34.9(1.1)	28.3(2.8) 35.5(0.7)	43.7(3.0) 33.2(0.6)	0.4
GRADUATED H.S.	1229	229,801(5%)	29.3(2.2) 37.5(0.6)	34.3(1.7) 38.2(0.5)	36.4(2.0) 34.4(0.5)	0.5
SOME EDUC AFTER H.S.	509	97,305(6%)	31.2(2.9) 39.1(0.8)	33.2(2.7) 40.7(0.9)	35.7(2.2) 35.8(0.7)	0.4
GRADUATED COLLEGE	3025	564,592(2%)	32.7(1.4) 42.0(0.4)	36.6(1.3) 41.2(0.3)	30.6(0.9) 36.8(0.4)	0.2
UNKNOWN	4412	818,397(2%)	31.3(1.1) 38.2(0.4)	34.2(0.7) 38.8(0.2)	34.5(1.2) 35.2(0.3)	0.5

Table 15.59

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 3

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	10945	2,018,312(1%)	100.0(0.0) 212.1(0.7)	0.0
SEX				
MALE	5588	1,016,660(1%)	100.0(0.0) 212.5(0.8)	0.0
FEMALE	5357	1,001,652(1%)	100.0(0.0) 211.7(0.8)	0.0
ETHNICITY/RACE				
WHITE	6657	1,449,945(1%)	100.0(0.0) 219.7(0.8)	0.0
BLACK	2044	289,851(2%)	100.0(0.0) 187.8(1.5)	0.0
HISPANIC	1859	210,709(3%)	100.0(0.0) 194.6(1.7)	0.0
OTHER	385	67,807(4%)	100.0(0.0) 207.9(2.5)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	473	81,939(5%)	100.0(0.0) 195.3(2.0)	0.0
GRADUATED H.S.	1383	258,258(5%)	100.0(0.0) 205.5(1.2)	0.0
SOME EDUC AFTER H.S.	572	108,824(5%)	100.0(0.0) 217.8(1.9)	0.0
GRADUATED COLLEGE	3379	630,423(3%)	100.0(0.0) 221.3(0.9)	0.0
UNKNOWN	4964	911,423(2%)	100.0(0.0) 209.0(0.7)	0.0

Table 15.60

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 3

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	10945	2,018,312(1%)	50.4(0.5) 212.5(0.8)	49.6(0.5) 211.7(0.8)	0.0
SEX					
MALE	5588	1,016,660(1%)	100.0(0.0) 212.5(0.8)	0.0(0.0) *****(0.0)	0.0
FEMALE	5357	1,001,652(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 211.7(0.8)	0.0
ETHNICITY/RACE					
WHITE	6657	1,449,945(1%)	50.2(0.8) 220.7(0.9)	49.8(0.8) 218.7(1.0)	0.0
BLACK	2044	289,851(2%)	47.8(1.2) 184.7(1.8)	52.2(1.2) 190.6(1.8)	0.0
HISPANIC	1859	210,709(3%)	54.4(1.3) 195.7(2.1)	45.6(1.3) 193.3(1.8)	0.0
OTHER	385	67,807(4%)	53.5(3.5) 207.9(3.1)	46.5(3.5) 207.8(3.3)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	473	81,939(5%)	46.6(2.3) 195.1(2.3)	53.4(2.3) 195.4(3.0)	0.0
GRADUATED H.S.	1383	258,258(5%)	53.1(1.6) 205.0(1.6)	46.9(1.6) 206.0(1.4)	0.0
SOME EDUC AFTER H.S.	572	108,824(5%)	53.5(2.4) 216.9(2.5)	46.5(2.4) 218.8(2.8)	0.0
GRADUATED COLLEGE	3379	630,423(3%)	53.6(1.1) 221.9(1.1)	46.4(1.1) 220.6(1.1)	0.0
UNKNOWN	4964	911,423(2%)	47.2(0.9) 209.2(1.0)	52.8(0.9) 208.8(1.1)	0.0

Table 15.61

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 3

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	10945	2,018,312(1%)	20.8(0.4) 213.8(1.2)	22.4(1.5) 209.2(1.2)	28.0(1.6) 216.4(1.5)	28.8(0.6) 208.9(1.5)	0.0
SEX							
MALE	5588	1,016,660(1%)	20.6(0.7) 215.1(1.6)	21.6(1.6) 209.0(1.2)	28.7(1.9) 216.6(1.5)	29.2(0.6) 209.3(1.7)	0.0
FEMALE	5357	1,001,652(1%)	20.9(0.6) 212.4(1.6)	23.3(1.6) 209.3(1.4)	27.4(1.5) 216.3(2.0)	28.4(0.8) 208.6(1.3)	0.0
ETHNICITY/RACE							
WHITE	6657	1,449,945(1%)	22.1(0.4) 219.8(1.2)	20.5(2.0) 219.6(1.6)	32.0(2.1) 221.8(1.6)	25.4(0.4) 217.0(1.9)	0.0
BLACK	2044	289,851(2%)	21.0(0.5) 191.1(4.4)	43.0(0.8) 187.9(2.0)	21.5(2.4) 184.9(3.0)	14.5(2.5) 187.0(2.6)	0.0
HISPANIC	1859	210,709(3%)	12.8(2.1) 195.8(3.2)	10.8(2.1) 189.2(3.1)	13.6(2.2) 198.9(5.2)	62.8(1.4) 194.4(2.1)	0.0
OTHER	385	67,807(4%)	16.3(3.1) 207.4(4.5)	11.5(2.6) 209.8(5.5)	15.9(4.0) 214.8(4.0)	56.3(6.1) 205.6(3.5)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	473	81,939(5%)	17.7(2.2) 192.5(3.6)	34.4(3.4) 195.2(2.6)	24.1(2.4) 201.2(4.6)	23.8(1.9) 191.4(3.0)	0.0
GRADUATED H.S.	1383	258,258(5%)	17.2(1.4) 207.3(3.0)	23.8(2.3) 199.3(1.6)	32.9(3.0) 212.2(2.1)	26.2(1.8) 201.4(2.4)	0.0
SOME EDUC AFTER H.S.	572	108,824(5%)	18.5(2.3) 215.6(3.3)	23.4(2.0) 216.2(3.3)	28.2(1.8) 224.7(4.2)	29.8(2.4) 213.9(3.6)	0.0
GRADUATED COLLEGE	3379	630,423(3%)	22.6(1.2) 224.1(1.8)	21.1(1.8) 217.2(1.9)	28.8(2.1) 225.1(1.8)	27.4(1.4) 218.3(2.0)	0.0
UNKNOWN	4964	911,423(2%)	20.1(1.1) 210.6(1.4)	21.9(1.9) 207.8(1.3)	27.1(1.8) 211.8(1.7)	30.8(1.3) 206.2(1.2)	0.0

Table 15.62

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 3

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	10945	2,018,312(1%)	71.8(0.4) 219.7(0.8)	14.4(0.2) 187.8(1.5)	10.4(0.3) 194.6(1.7)	1.2(0.2) 211.3(3.8)	2.1(0.2) 205.6(2.7)	0.1(0.0) 219.1(10.0)	0.0
SEX									
MALE	5588	1,016,660(1%)	71.5(0.6) 220.7(0.9)	13.6(0.3) 184.7(1.8)	11.3(0.5) 195.7(2.1)	1.3(0.2) 207.7(4.5)	2.2(0.3) 207.6(3.8)	0.1(0.0) 222.1(13.1)	0.0
FEMALE	5357	1,001,652(1%)	72.2(0.6) 218.7(1.0)	15.1(0.4) 190.6(1.8)	9.6(0.4) 193.3(1.8)	1.1(0.3) 215.5(4.7)	2.0(0.2) 203.3(3.8)	0.0(0.0) 214.4(10.9)	0.0
ETHNICITY/RACE									
WHITE	6657	1,449,945(1%)	100.0(0.0) 219.7(0.8)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	2044	289,851(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 187.8(1.5)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	1859	210,709(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 194.6(1.7)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	385	67,807(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	36.2(5.3) 211.3(3.8)	62.1(5.4) 205.6(2.7)	1.7(0.6) 219.1(10.0)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	473	81,939(5%)	66.2(2.9) 201.8(3.0)	17.7(2.4) 181.8(3.1)	14.2(1.3) 182.9(4.7)	0.3(0.2) 170.9(32.7)	1.6(0.7) 188.2(10.5)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	1383	258,258(5%)	70.7(1.6) 213.5(1.2)	14.2(1.0) 181.3(2.2)	12.1(1.0) 190.6(2.5)	0.6(0.2) 178.1(13.0)	2.4(0.5) 192.5(3.8)	0.1(0.1) 247.6(****)	0.0
SOME EDUC AFTER H.S.	572	108,824(5%)	71.9(1.9) 226.7(2.2)	13.8(1.2) 190.4(3.3)	12.3(1.4) 199.8(4.4)	0.8(0.4) 190.9(21.5)	1.2(0.5) 202.5(13.4)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3379	630,423(3%)	73.9(1.0) 229.2(0.8)	14.1(0.8) 192.9(1.5)	8.4(0.6) 202.0(3.3)	1.4(0.3) 215.9(5.8)	2.2(0.3) 216.7(4.7)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	4964	911,423(2%)	71.6(0.6) 215.8(0.9)	14.2(0.4) 186.7(1.8)	10.6(0.6) 193.2(1.5)	1.3(0.3) 213.8(6.0)	2.1(0.3) 203.4(3.4)	0.1(0.0) 212.8(8.1)	0.0

Table 15.63

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 3
by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	10771	1,990,867(1%)	4.1(0.2) 195.3(2.0)	13.0(0.7) 205.5(1.2)	5.5(0.3) 217.8(1.9)	31.7(0.9) 221.3(0.9)	45.8(0.9) 209.0(0.7)	1.4
SEX								
MALE	5493	1,001,870(1%)	3.8(0.3) 195.1(2.3)	13.7(0.8) 205.0(1.6)	5.8(0.4) 216.9(2.5)	33.7(1.1) 221.9(1.1)	42.9(1.0) 209.2(1.0)	1.5
FEMALE	5278	988,997(1%)	4.4(0.3) 195.4(3.0)	12.3(0.8) 206.0(1.4)	5.1(0.4) 218.8(2.8)	29.6(1.0) 220.6(1.1)	48.7(1.1) 208.8(1.1)	1.3
ETHNICITY/RACE								
WHITE	6567	1,433,424(1%)	3.8(0.3) 201.8(3.0)	12.7(0.8) 213.5(1.2)	5.5(0.3) 226.7(2.2)	32.5(1.1) 229.2(0.8)	45.5(1.0) 215.8(0.9)	1.1
BLACK	2008	284,850(2%)	5.1(0.7) 181.8(3.1)	12.8(1.0) 181.3(2.2)	5.3(0.5) 190.4(3.3)	31.2(1.4) 192.9(1.5)	45.6(1.9) 186.7(1.8)	1.7
HISPANIC	1820	206,320(3%)	5.6(0.6) 182.9(4.7)	15.2(1.1) 190.6(2.5)	6.5(0.7) 199.8(4.4)	25.8(1.7) 202.0(3.3)	46.9(2.0) 193.2(1.5)	2.1
OTHER	376	66,273(5%)	2.3(0.8) 185.6(8.9)	11.9(2.0) 191.3(4.9)	3.4(1.1) 198.0(13.1)	33.8(3.2) 216.4(3.7)	48.7(4.1) 207.5(3.1)	2.3
PARENTAL EDUCATION								
LESS THAN H.S.	473	81,939(5%)	100.0(0.0) 195.3(2.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	1383	258,258(5%)	0.0(0.0) *****(0.0)	100.0(0.0) 205.5(1.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	572	108,824(5%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 217.8(1.9)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3379	630,423(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 221.3(0.9)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	4964	911,423(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 209.0(0.7)	0.0

Table 15.64

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 3

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	10756	1,988,146(1%)	41.1(0.8) 201.4(0.7)	31.2(0.5) 216.5(0.9)	27.7(0.9) 224.0(0.8)	1.5
SEX						
MALE	5487	1,000,987(1%)	39.9(0.9) 200.4(1.1)	30.3(0.6) 217.4(1.2)	29.7(0.9) 224.8(0.8)	1.5
FEMALE	5269	987,159(1%)	42.3(1.1) 202.4(0.8)	32.0(0.8) 215.6(1.0)	25.6(1.1) 223.1(1.4)	1.4
ETHNICITY/RACE						
WHITE	6562	1,432,921(1%)	36.3(1.0) 210.1(0.8)	32.7(0.6) 222.6(0.9)	31.0(1.1) 228.6(0.9)	1.2
BLACK	2007	284,654(2%)	51.9(1.4) 182.2(1.6)	28.2(1.1) 191.3(2.0)	19.9(1.4) 197.9(2.6)	1.8
HISPANIC	1811	204,321(4%)	56.1(1.8) 186.9(1.7)	25.6(1.1) 201.4(2.9)	18.3(1.4) 209.7(2.5)	3.0
OTHER	376	66 251(5%)	52.3(3.4) 200.4(3.5)	28.9(2.8) 212.7(3.6)	18.8(2.8) 221.2(3.9)	2.3
PARENTAL EDUCATION						
LESS THAN H.S.	469	81,425(5%)	60.9(2.2) 189.8(1.9)	25.3(2.1) 200.4(4.1)	13.8(1.2) 211.1(4.1)	0.6
GRADUATED H.S.	1375	256,603(5%)	43.9(1.6) 197.8(1.5)	32.2(1.9) 209.7(2.2)	23.9(1.4) 214.4(2.1)	0.6
SOME EDUC AFTER H.S.	570	108,570(5%)	34.6(2.1) 202.8(3.0)	34.2(2.5) 223.1(2.3)	31.3(2.6) 228.7(3.2)	0.2
GRADUATED COLLEGE	3374	629,577(3%)	26.4(0.8) 208.2(1.2)	34.2(1.0) 222.0(1.5)	39.4(1.3) 229.7(1.0)	0.1
UNKNOWN	4950	909,265(2%)	49.4(1.1) 201.1(0.9)	29.1(0.7) 214.4(0.8)	21.6(0.9) 219.8(1.4)	0.2

Table 15.65

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 3

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	10803	1,992,886(1%)	31.2(0.8) 214.8(1.2)	35.2(0.7) 219.5(0.8)	33.6(0.7) 202.5(0.8)	1.3
SEX						
MALE	5514	1,003,808(1%)	28.4(0.9) 215.4(1.5)	35.8(1.2) 220.0(1.1)	35.8(0.9) 203.4(0.9)	1.3
FEMALE	5289	989,078(1%)	34.1(1.1) 214.2(1.2)	34.6(0.8) 219.0(0.9)	31.3(0.9) 201.4(0.9)	1.3
ETHNICITY/RACE						
WHITE	6567	1,432,280(1%)	32.9(0.9) 221.1(1.4)	38.4(0.9) 225.3(0.9)	28.8(0.8) 211.5(1.0)	1.2
BLACK	2017	285,656(2%)	22.8(1.4) 187.8(1.6)	24.7(1.4) 193.3(1.6)	52.5(1.7) 185.4(1.8)	1.4
HISPANIC	1839	208,092(3%)	31.1(1.5) 195.8(2.3)	29.7(1.1) 201.5(1.6)	39.3(1.8) 189.0(2.1)	1.2
OTHER	380	66,857(4%)	32.4(3.0) 214.9(4.3)	29.9(2.5) 209.4(4.2)	37.6(2.8) 201.0(3.4)	1.4
PARENTAL EDUCATION						
LESS THAN H.S.	471	81,632(5%)	25.5(3.4) 194.0(4.2)	33.7(3.0) 202.5(3.3)	40.8(2.9) 190.4(1.7)	0.4
GRADUATED H.S.	1376	257,053(5%)	27.2(1.3) 205.3(2.3)	37.6(1.3) 214.0(1.8)	35.2(1.5) 196.8(2.0)	0.5
SOME EDUC AFTER H.S.	571	108,671(5%)	27.0(2.8) 220.3(2.7)	38.3(2.6) 224.3(3.1)	34.7(3.0) 208.8(2.7)	0.1
GRADUATED COLLEGE	3373	629,203(3%)	32.1(1.3) 225.6(1.3)	36.8(1.3) 227.7(1.0)	31.1(1.0) 209.4(1.5)	0.2
UNKNOWN	4948	908,738(2%)	32.8(1.0) 210.8(1.4)	33.2(0.7) 216.0(1.0)	34.0(0.8) 200.4(1.1)	0.3

375

37

Table 15.66

Weighted Response Percentages and General Science Proficiency Means, Grade 3

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	11046	2,028,061(1%)	100.0(0.0) 212.1(0.8)	0.0
SEX				
MALE	5570	1,009,292(1%)	100.0(0.0) 212.0(0.9)	0.0
FEMALE	5476	1,018,770(2%)	100.0(0.0) 212.2(0.8)	0.0
ETHNICITY/RACE				
WHITE	6705	1,455,828(1%)	100.0(0.0) 222.4(0.9)	0.0
BLACK	2034	288,883(1%)	100.0(0.0) 180.0(1.8)	0.0
HISPANIC	1911	215,167(3%)	100.0(0.0) 188.8(1.4)	0.0
OTHER	396	68,183(5%)	100.0(0.0) 203.0(3.0)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	498	88,005(5%)	100.0(0.0) 190.6(1.7)	0.0
GRADUATED H.S.	1366	253,904(6%)	100.0(0.0) 204.3(1.4)	0.0
SOME EDUC AFTER H.S.	588	110,858(5%)	100.0(0.0) 220.2(1.9)	0.0
GRADUATED COLLEGE	3442	643,297(3%)	100.0(0.0) 224.4(1.1)	0.0
UNKNOWN	4974	904,037(2%)	100.0(0.0) 207.5(0.9)	0.0

Table 15.67

Weighted Response Percentages and General Science Proficiency Means, Grade 3

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	11046	2,028,061(1%)	49.8(0.6)	50.2(0.6)	0.0
			212.0(0.9)	212.2(0.8)	
SEX					
MALE	5570	1,009,292(1%)	100.0(0.0)	0.0(0.0)	0.0
			212.0(0.9)	*****(0.0)	
FEMALE	5476	1,018,770(2%)	0.0(0.0)	100.0(0.0)	0.0
			*****(0.0)	212.2(0.8)	
ETHNICITY/RACE					
WHITE	6705	1,455,828(1%)	49.5(0.9)	50.5(0.9)	0.0
			223.1(1.0)	221.6(1.1)	
BLACK	2034	288,883(1%)	47.1(1.2)	52.9(1.2)	0.0
			177.6(1.7)	182.1(2.2)	
HISPANIC	1911	215,167(3%)	54.4(1.3)	45.6(1.3)	0.0
			187.2(2.0)	190.8(1.2)	
OTHER	396	68,183(5%)	52.9(3.6)	47.1(3.6)	0.0
			201.2(4.4)	205.0(4.0)	
PARENTAL EDUCATION					
LESS THAN H.S.	498	88,005(5%)	43.2(3.2)	56.8(3.2)	0.0
			188.0(3.0)	192.7(2.4)	
GRADUATED H.S.	1366	253,904(6%)	54.9(1.3)	45.1(1.3)	0.0
			203.4(1.7)	205.5(2.1)	
SOME EDUC AFTER H.S.	588	110,858(5%)	54.7(2.7)	45.3(2.7)	0.0
			219.0(2.5)	221.7(2.9)	
GRADUATED COLLEGE	3442	643,297(3%)	52.8(1.1)	47.2(1.1)	0.0
			224.3(1.3)	224.6(1.3)	
UNKNOWN	4974	904,037(2%)	46.2(0.9)	53.8(0.9)	0.0
			207.2(1.1)	207.8(1.0)	

Table 15.68

Weighted Response Percentages and General Science Proficiency Means, Grade 3

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	11046	2,028,061(1%)	20.3(0.3) 215.1(1.7)	22.9(1.6) 208.7(1.7)	27.8(1.7) 217.0(1.4)	29.0(0.5) 208.1(1.6)	0.0
SEX							
MALE	5570	1,009,292(1%)	19.3(0.7) 217.4(1.9)	22.7(1.7) 208.4(1.9)	27.6(1.9) 217.0(1.3)	30.5(0.8) 206.9(1.8)	0.0
FEMALE	5476	1,018,770(2%)	21.4(0.5) 213.1(1.9)	23.1(1.7) 208.9(1.7)	27.9(1.8) 217.1(2.0)	27.5(0.8) 209.4(1.5)	0.0
ETHNICITY/RACE							
WHITE	6705	1,455,828(1%)	21.4(0.3) 224.4(1.7)	21.3(2.2) 221.2(1.7)	31.8(2.1) 224.2(1.4)	25.5(0.3) 219.5(2.0)	0.0
BLACK	2034	288,883(1%)	20.3(0.3) 181.9(5.9)	42.5(0.5) 182.1(2.5)	21.3(2.5) 174.8(3.2)	15.8(2.7) 178.8(2.6)	0.0
HISPANIC	1911	215,167(3%)	13.8(2.5) 188.3(3.3)	10.4(2.2) 182.0(3.6)	13.6(2.2) 194.0(4.1)	62.1(1.2) 189.0(2.1)	0.0
OTHER	396	68,183(5%)	17.8(2.9) 202.9(6.1)	13.8(2.5) 208.3(4.2)	14.4(3.3) 215.3(3.6)	53.9(5.1) 198.3(4.7)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	498	88,005(5%)	13.3(2.0) 190.5(5.3)	34.7(3.6) 188.9(3.0)	24.8(2.7) 197.0(4.4)	27.2(2.1) 187.1(2.6)	0.0
GRADUATED H.S.	1366	253,904(6%)	18.4(1.7) 208.9(3.6)	24.3(2.6) 197.2(2.0)	31.3(3.1) 211.5(2.4)	25.9(1.4) 199.1(2.5)	0.0
SOME EDUC AFTER H.S.	588	110,858(5%)	17.6(1.8) 221.3(4.2)	24.3(2.5) 216.6(3.0)	29.8(2.4) 228.4(3.3)	28.3(2.0) 214.2(3.5)	0.0
GRADUATED COLLEGE	3442	643,297(3%)	22.4(1.1) 228.0(1.8)	21.4(1.9) 220.0(2.7)	28.9(2.3) 228.6(2.2)	27.3(1.3) 220.6(2.3)	0.0
UNKNOWN	4974	904,037(2%)	19.5(0.8) 210.2(2.1)	22.3(1.7) 206.5(2.2)	26.8(1.7) 210.4(1.5)	31.4(1.1) 204.1(1.3)	0.0

Table 15.69

Weighted Response Percentages and General Science Proficiency Means, Grade 3

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	11046	2,028,061(1%)	71.8(0.4) 222.4(0.9)	14.2(0.2) 180.0(1.8)	10.6(0.3) 188.8(1.4)	1.3(0.2) 199.4(3.6)	1.9(0.1) 204.6(3.7)	0.1(0.0) 217.4(6.5)	0.0
SEX									
MALE	5570	1,009,292(1%)	71.3(0.6) 223.1(1.0)	13.5(0.4) 177.6(1.7)	11.6(0.4) 187.2(2.0)	1.4(0.2) 195.9(6.2)	2.1(0.2) 204.7(4.4)	0.0(0.0) 200.8(20.4)	0.0
FEMALE	5476	1,018,770(2%)	72.2(0.7) 221.6(1.1)	15.0(0.3) 182.1(2.2)	9.6(0.4) 190.8(1.2)	1.2(0.3) 203.6(5.2)	1.8(0.2) 204.4(5.3)	0.2(0.1) 222.4(8.0)	0.0
ETHNICITY/RACE									
WHITE	6705	1,455,828(1%)	100.0(0.0) 222.4(0.9)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	2034	288,883(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 180.0(1.8)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	1911	215,167(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 188.8(1.4)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	396	68,183(5%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	39.0(4.1) 199.4(3.6)	57.8(4.3) 204.6(3.7)	3.2(1.0) 217.4(6.5)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	498	88,005(5%)	66.2(3.4) 197.5(2.1)	17.9(2.4) 172.6(4.5)	13.7(1.5) 181.8(2.7)	0.5(0.3) 183.9(22.9)	1.8(0.7) 185.6(17.1)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	1366	253,904(6%)	70.2(1.3) 214.9(1.8)	15.3(1.0) 172.4(2.5)	11.7(0.8) 186.8(2.7)	0.7(0.2) 167.1(12.6)	2.1(0.4) 195.1(7.3)	0.1(0.1) 204.3(13.7)	0.0
SOME EDUC AFTER H.S.	588	110,858(5%)	73.4(1.5) 232.3(2.0)	13.0(1.4) 179.7(4.6)	12.4(1.2) 193.8(3.5)	0.6(0.3) 158.8(11.1)	0.6(0.3) 233.5(10.3)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3442	643,297(3%)	75.3(1.0) 233.6(1.0)	13.0(0.7) 190.1(2.3)	8.4(0.6) 197.3(3.2)	1.4(0.3) 223.9(6.6)	1.8(0.2) 217.6(5.2)	0.1(0.1) 231.0(16.8)	0.0
UNKNOWN	4974	904,037(2%)	70.4(0.9) 217.8(1.0)	14.5(0.5) 177.0(2.2)	11.2(0.6) 186.0(1.5)	1.5(0.3) 191.4(4.4)	2.2(0.2) 200.1(4.9)	0.2(0.1) 213.9(8.6)	0.0

BEST COPY AVAILABLE

Table 15.70

Weighted Response Percentages and General Science Proficiency Means, Grade 3

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	10868	2,000,101(1%)	4.4(0.2) 190.6(1.7)	12.7(0.7) 204.3(1.4)	5.5(0.3) 220.2(1.9)	32.2(0.9) 224.4(1.1)	45.2(0.9) 207.5(0.9)	1.4
SEX								
MALE	5474	995,136(1%)	3.8(0.4) 188.0(3.0)	14.0(1.0) 203.4(1.7)	6.1(0.3) 219.0(2.5)	34.1(1.2) 224.3(1.3)	42.0(1.1) 207.2(1.1)	1.4
FEMALE	5394	1,004,965(2%)	5.0(0.4) 192.7(2.4)	11.4(0.5) 205.5(2.1)	5.0(0.4) 221.7(2.9)	30.2(0.9) 224.6(1.3)	48.4(1.0) 207.8(1.0)	1.4
ETHNICITY/RACE								
WHITE	6611	1,438,573(1%)	4.1(0.3) 197.5(2.1)	12.4(0.8) 214.9(1.8)	5.7(0.3) 232.3(2.0)	33.7(1.3) 233.6(1.0)	44.2(1.1) 217.8(1.0)	1.2
BLACK	1999	283,798(1%)	5.5(0.7) 172.6(4.5)	13.7(0.9) 172.4(2.5)	5.1(0.6) 179.7(4.6)	29.5(1.3) 190.1(2.3)	46.1(1.6) 177.0(2.2)	1.8
HISPANIC	1872	211,132(3%)	5.7(0.6) 181.8(2.7)	14.1(1.1) 186.8(2.7)	6.5(0.6) 193.8(3.5)	25.7(1.6) 197.3(3.2)	48.0(1.8) 186.0(1.5)	1.9
OTHER	386	66,599(6%)	3.0(0.9) 185.2(13.9)	10.6(1.7) 188.6(6.4)	2.0(0.8) 197.3(11.3)	31.4(2.8) 220.6(4.4)	53.0(3.0) 197.3(3.8)	2.3
PARENTAL EDUCATION								
LESS THAN H.S.	498	88,005(5%)	100.0(0.0) 190.6(1.7)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	1366	253,904(6%)	0.0(0.0) *****(0.0)	100.0(0.0) 204.3(1.4)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	588	110,858(5%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 220.2(1.9)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3442	643,297(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 224.4(1.1)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	4974	904,037(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 207.5(0.9)	0.0

Table 15.71

Weighted Response Percentages and General Science Proficiency Means, Grade 3

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	10849	1,996,563(1%)	40.3(0.8) 199.2(1.0)	32.0(0.5) 216.8(1.0)	27.7(0.7) 227.2(1.0)	1.6
SEX						
MALE	5463	993,166(1%)	39.9(1.1) 197.4(1.3)	31.2(0.5) 217.7(1.3)	28.9(0.9) 227.8(1.2)	1.6
FEMALE	5386	1,003,398(2%)	40.7(1.0) 200.9(1.0)	32.8(0.9) 215.9(1.1)	26.5(0.9) 226.6(1.4)	1.5
ETHNICITY/RACE						
WHITE	6603	1,437,354(1%)	35.1(1.0) 211.3(1.2)	33.6(0.6) 224.7(0.9)	31.2(0.9) 233.7(1.2)	1.3
BLACK	1995	283,146(1%)	52.2(1.7) 174.0(1.8)	27.9(1.2) 184.0(2.6)	19.9(1.3) 191.1(2.8)	2.0
HISPANIC	1866	209,624(4%)	56.1(1.8) 180.2(2.0)	26.9(1.3) 196.1(2.1)	17.0(1.3) 208.0(1.8)	2.6
OTHER	385	66,438(6%)	51.1(3.2) 194.0(2.9)	30.7(3.7) 213.1(5.2)	18.1(3.4) 214.0(6.1)	2.6
PARENTAL EDUCATION						
LESS THAN H.S.	495	87,589(5%)	58.0(2.7) 184.8(2.2)	26.3(2.7) 194.4(4.2)	15.6(1.9) 206.9(4.9)	0.5
GRADUATED H.S.	1355	251,812(6%)	43.5(1.9) 195.8(2.1)	32.4(1.9) 209.1(2.3)	24.1(1.3) 214.0(2.6)	0.8
SOME EDUC AFTER H.S.	587	110,706(5%)	32.9(2.5) 203.8(3.7)	35.2(2.3) 225.5(2.8)	31.9(2.8) 231.5(3.3)	0.1
GRADUATED COLLEGE	3438	642,697(3%)	26.7(1.2) 209.6(1.9)	34.9(1.0) 223.9(1.3)	38.4(1.2) 235.4(1.4)	0.1
UNKNOWN	4960	901,873(2%)	48.2(1.1) 197.3(1.2)	30.1(0.8) 213.9(1.2)	21.8(0.8) 221.8(1.3)	0.2

Table 15.72

Weighted Response Percentages and General Science Proficiency Means, Grade 3

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	10893	2,000,901(1%)	31.4(1.0) 217.2(1.0)	34.1(0.7) 221.6(1.0)	34.5(0.9) 199.2(0.9)	1.3
SEX						
MALE	5494	996,538(1%)	28.7(1.2) 217.8(1.4)	34.6(1.0) 221.6(1.1)	36.7(1.1) 199.4(1.1)	1.3
FEMALE	5399	1,004,363(2%)	34.0(1.2) 216.7(1.1)	33.6(0.9) 221.6(1.2)	32.3(1.0) 198.9(1.3)	1.4
ETHNICITY/RACE						
WHITE	6612	1,437,550(1%)	33.5(1.1) 225.2(1.3)	37.3(0.9) 229.3(1.0)	29.2(1.0) 211.5(1.2)	1.3
BLACK	2003	284,024(1%)	22.2(1.4) 182.4(2.7)	24.6(1.2) 187.4(2.3)	53.2(1.3) 175.8(2.0)	1.7
HISPANIC	1889	212,358(3%)	28.5(1.7) 191.9(1.8)	28.5(1.4) 196.7(1.3)	43.0(2.2) 182.4(2.0)	1.3
OTHER	389	66,968(5%)	33.4(3.3) 211.0(5.2)	24.7(2.5) 207.8(4.4)	41.9(3.5) 195.2(4.3)	1.8
PARENTAL EDUCATION						
LESS THAN H.S.	496	87,699(5%)	26.9(3.1) 191.4(3.7)	28.5(2.1) 201.4(2.8)	44.6(3.2) 183.6(2.2)	0.3
GRADUATED H.S.	1357	252,492(6%)	26.8(1.5) 206.7(3.2)	35.9(1.3) 213.7(2.2)	37.2(1.5) 193.7(1.9)	0.6
SOME EDUC AFTER H.S.	586	110,605(5%)	29.3(2.9) 223.7(3.5)	35.2(2.6) 230.5(2.5)	35.5(2.6) 207.4(3.5)	0.2
GRADUATED COLLEGE	3437	642,331(3%)	33.4(1.4) 230.1(1.3)	35.4(1.2) 233.0(1.3)	31.2(1.1) 208.6(1.6)	0.2
UNKNOWN	4953	900,649(2%)	31.9(1.4) 211.6(1.3)	33.1(0.8) 216.1(1.1)	35.0(1.2) 195.9(1.3)	0.4

Table 15.73

Weighted Response Percentages and General Reading Proficiency Means, Grade 7

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	9513	1,246,019(1%)	100.0(0.0) 48.8(0.1)	0.0
SEX				
MALE	4825	643,531(1%)	100.0(0.0) 47.5(0.2)	0.0
FEMALE	4688	602,488(1%)	100.0(0.0) 50.2(0.1)	0.0
ETHNICITY/RACE				
WHITE	5582	881,376(1%)	100.0(0.0) 50.3(0.2)	0.0
BLACK	1988	186,850(2%)	100.0(0.0) 45.2(0.3)	0.0
HISPANIC	1605	131,095(2%)	100.0(0.0) 44.4(0.4)	0.0
OTHER	338	46,698(6%)	100.0(0.0) 48.6(0.9)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	773	93,940(6%)	100.0(0.0) 45.8(0.3)	0.0
GRADUATED H.S.	2662	354,369(3%)	100.0(0.0) 47.6(0.2)	0.0
SOME EDUC AFTER H.S.	1321	179,733(2%)	100.0(0.0) 50.4(0.3)	0.0
GRADUATED COLLEGE	3342	452,980(3%)	100.0(0.0) 50.9(0.2)	0.0
UNKNOWN	1294	153,622(4%)	100.0(0.0) 45.6(0.3)	0.0

Table 15.74

Weighted Response Percentages and General Reading Proficiency Means, Grade 7

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	9513	1,246,019(1%)	51.6(0.5) 47.5(0.2)	48.4(0.5) 50.2(0.1)	0.0
SEX					
MALE	4825	643,531(1%)	100.0(0.0) 47.5(0.2)	0.0(0.0) *****(0.0)	0.0
FEMALE	4688	602,488(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 50.2(0.1)	0.0
ETHNICITY/RACE					
WHITE	5582	881,376(1%)	51.5(0.7) 49.0(0.2)	48.5(0.7) 51.6(0.2)	0.0
BLACK	1988	186,850(2%)	50.0(1.4) 43.7(0.3)	50.0(1.4) 46.6(0.4)	0.0
HISPANIC	1605	131,095(2%)	53.4(1.5) 43.1(0.5)	46.6(1.5) 45.9(0.5)	0.0
OTHER	338	46,698(6%)	55.9(3.0) 47.4(1.1)	44.1(3.0) 50.2(1.1)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	773	93,940(6%)	39.5(2.2) 44.1(0.6)	60.5(2.2) 46.9(0.4)	0.0
GRADUATED H.S.	2662	354,369(3%)	51.2(0.9) 46.0(0.3)	48.8(0.9) 49.4(0.3)	0.0
SOME EDUC AFTER H.S.	1321	179,733(2%)	47.5(1.9) 48.8(0.5)	52.5(1.9) 51.8(0.4)	0.0
GRADUATED COLLEGE	3342	452,980(3%)	54.4(0.8) 49.6(0.2)	45.6(0.8) 52.4(0.2)	0.0
UNKNOWN	1294	153,622(4%)	56.3(1.7) 44.9(0.4)	43.7(1.7) 46.6(0.4)	0.0

Table 15.75

Weighted Response Percentages and General Reading Proficiency Means, Grade 7

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	9513	1,246,019(1%)	20.7(0.5) 50.5(0.4)	22.8(1.5) 48.1(0.2)	26.9(1.8) 49.0(0.2)	29.5(0.7) 48.0(0.4)	0.0
SEX							
MALE	4825	643,531(1%)	19.7(0.8) 49.1(0.4)	22.6(1.5) 46.6(0.3)	27.0(1.8) 47.7(0.3)	30.7(0.9) 46.9(0.5)	0.0
FEMALE	4688	602,488(1%)	21.8(0.5) 52.0(0.[illegible])	23.1(1.7) 49.5(0.3)	26.8(1.9) 50.4(0.2)	28.4(0.7) 49.3(0.3)	0.0
ETHNICITY/RACE							
WHITE	5582	881,376(1%)	22.5(0.3) 51.6(0.4)	21.2(2.2) 49.6(0.3)	31.5(2.2) 49.9(0.3)	24.9(0.4) 50.1(0.3)	0.0
BLACK	1988	186,850(2%)	19.8(0.9) 46.2(0.9)	42.9(0.9) 45.2(0.4)	18.7(3.6) 44.8(0.4)	18.6(3.1) 44.4(1.0)	0.0
HISPANIC	1605	131,095(2%)	10.8(2.0) 45.6(1.2)	10.9(1.8) 43.7(0.8)	11.6(2.1) 44.6(0.8)	66.7(0.9) 44.3(0.6)	0.0
OTHER	338	46,698(6%)	18.0(5.9) 52.0(1.8)	7.8(2.8) 48.5(2.2)	17.4(4.8) 46.6(1.4)	56.8(7.8) 48.2(1.3)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	773	93,940(6%)	17.3(2.4) 46.9(0.9)	28.6(3.7) 45.8(0.4)	20.9(3.3) 45.6(1.0)	33.2(2.7) 45.2(0.6)	0.0
GRADUATED H.S.	2662	354,369(3%)	17.6(0.8) 49.1(0.7)	26.1(2.0) 47.1(0.4)	30.6(2.3) 47.9(0.4)	25.7(1.0) 46.9(0.4)	0.0
SOME EDUC AFTER H.S.	1321	179,733(2%)	19.6(1.3) 51.8(0.6)	20.0(1.8) 50.0(0.4)	29.7(2.2) 50.6(0.5)	30.8(1.5) 49.5(0.8)	0.0
GRADUATED COLLEGE	3342	452,980(3%)	23.9(1.3) 52.4(0.4)	21.2(1.7) 49.9(0.5)	26.1(1.8) 50.9(0.4)	28.8(1.4) 50.4(0.5)	0.0
UNKNOWN	1294	153,622(4%)	20.9(1.6) 47.3(0.5)	18.7(2.4) 45.0(0.6)	22.1(2.5) 45.7(0.6)	38.3(2.1) 44.7(0.6)	0.0

Table 15.76

Weighted Response Percentages and General Reading Proficiency Means, Grade 7

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	9513	1,246,019(1%)	70.7(0.4) 50.3(0.2)	15.0(0.3) 45.2(0.3)	10.5(0.2) 44.4(0.4)	1.8(0.4) 51.8(1.0)	1.7(0.3) 45.3(1.1)	0.2(0.2) 48.4(0.8)	0.0
SEX									
MALE	4825	643,531(1%)	70.6(0.6) 49.0(0.2)	14.5(0.4) 43.7(0.3)	10.9(0.4) 43.1(0.5)	1.8(0.4) 50.0(1.4)	2.0(0.3) 45.0(1.5)	0.3(0.2) 47.0(0.8)	0.0
FEMALE	4688	602,488(1%)	70.9(0.6) 51.6(0.2)	15.5(0.5) 46.6(0.4)	10.1(0.4) 45.9(0.5)	1.8(0.4) 53.7(1.4)	1.4(0.3) 45.7(1.2)	0.2(0.2) 50.3(1.3)	0.0
ETHNICITY/RACE									
WHITE	5582	881,376(1%)	100.0(0.0) 50.3(0.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	1988	186,850(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 45.2(0.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	1605	131,095(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 44.4(0.4)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	338	46,698(6%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	48.3(8.0) 51.8(1.0)	45.4(8.5) 45.3(1.1)	6.3(5.2) 48.4(0.8)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	773	93,940(6%)	59.1(2.7) 46.9(0.4)	12.4(1.3) 44.4(0.9)	24.5(2.5) 44.2(0.7)	0.7(0.3) 45.3(2.8)	3.4(1.5) 42.8(2.6)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	2662	354,369(3%)	72.2(0.9) 48.9(0.3)	15.6(0.7) 44.8(0.4)	9.5(0.5) 43.6(0.6)	0.8(0.3) 46.9(2.2)	1.9(0.6) 44.4(1.8)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	1321	179,733(2%)	75.0(1.3) 51.6(0.3)	15.0(1.1) 47.3(0.7)	7.0(0.6) 45.1(1.0)	0.7(0.3) 47.7(3.0)	2.2(0.7) 46.0(1.4)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3342	452,980(3%)	75.7(0.9) 52.2(0.2)	14.6(0.7) 45.3(0.4)	6.2(0.5) 46.6(0.6)	2.5(0.6) 55.2(1.3)	1.0(0.2) 49.0(1.2)	0.0(0.0) 49.9(4.7)	0.0
UNKNOWN	1294	153,622(4%)	55.0(2.1) 46.9(0.4)	17.1(1.2) 43.8(0.6)	21.9(1.5) 43.2(0.5)	4.2(1.3) 48.9(1.3)	1.8(0.5) 43.7(2.0)	0.0(0.1) 42.6(40.4)	0.0

Table 15.77

Weighted Response Percentages and General Reading Proficiency Means, Grade 7

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	9392	1,234,645(1%)	7.6(0.4) 45.8(0.3)	28.7(0.7) 47.6(0.2)	14.6(0.3) 50.4(0.3)	36.7(1.0) 50.9(0.2)	12.4(0.5) 45.6(0.3)	0.9
SEX								
MALE	4751	636,861(1%)	5.8(0.4) 44.1(0.6)	28.5(0.9) 46.0(0.3)	13.4(0.6) 48.8(0.5)	38.7(1.1) 49.6(0.2)	13.6(0.8) 44.9(0.4)	1.0
FEMALE	4641	597,784(1%)	9.5(0.7) 46.9(0.4)	28.9(0.8) 49.4(0.3)	15.8(0.7) 51.8(0.4)	34.5(1.1) 52.4(0.2)	11.2(0.5) 46.6(0.4)	0.8
ETHNICITY/RACE								
WHITE	5527	873,709(1%)	6.4(0.5) 46.9(0.4)	29.3(0.9) 48.9(0.3)	15.4(0.5) 51.6(0.3)	39.3(1.3) 52.2(0.2)	9.7(0.5) 46.9(0.4)	0.9
BLACK	1983	186,266(2%)	6.2(0.7) 44.4(0.9)	29.7(1.2) 44.8(0.4)	14.5(1.0) 47.3(0.7)	35.5(1.4) 45.3(0.4)	14.1(1.0) 43.8(0.6)	0.3
HISPANIC	1603	130,970(2%)	17.5(1.3) 44.2(0.7)	25.7(1.4) 43.6(0.6)	9.6(0.9) 45.1(1.0)	21.4(1.9) 46.6(0.6)	25.7(2.1) 43.2(0.5)	0.1
OTHER	279	43,700(8%)	8.7(3.2) 43.2(2.1)	21.6(4.5) 45.1(1.5)	12.1(3.0) 46.4(1.5)	36.3(6.2) 53.4(1.0)	21.2(4.1) 47.3(1.2)	6.4
PARENTAL EDUCATION								
LESS THAN H.S.	773	93,940(6%)	100.0(0.0) 45.8(0.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	2662	354,369(3%)	0.0(0.0) *****(0.0)	100.0(0.0) 47.6(0.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	1321	179,733(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 50.4(0.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	3342	452,980(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 50.9(0.2)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	1294	153,622(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 45.6(0.3)	0.0

Table 15.78

Weighted Response Percentages and General Reading Proficiency Means, Grade 7

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	9393	1,235,092(1%)	22.8(0.7)	30.1(0.7)	47.1(1.0)	0.9
			45.3(0.3)	48.7(0.2)	50.6(0.1)	
SEX						
MALE	4750	636,968(1%)	23.6(0.8)	29.9(0.7)	46.5(1.1)	1.0
			43.9(0.4)	47.3(0.3)	49.5(0.2)	
FEMALE	4643	598,124(1%)	21.9(0.8)	30.3(1.0)	47.8(1.3)	0.7
			46.8(0.3)	50.2(0.2)	51.8(0.2)	
ETHNICITY/RACE						
WHITE	5532	874,461(1%)	17.4(0.9)	30.0(0.9)	52.6(1.3)	0.8
			46.9(0.4)	50.0(0.3)	51.5(0.2)	
BLACK	1982	186,224(2%)	30.7(1.3)	31.2(0.7)	38.1(1.5)	0.3
			43.7(0.5)	44.9(0.4)	46.6(0.4)	
HISPANIC	1600	130,768(2%)	45.7(2.4)	28.4(1.3)	25.9(1.9)	0.2
			42.5(0.5)	45.5(0.6)	46.4(0.6)	
OTHER	279	43,639(8%)	28.8(3.3)	32.4(3.7)	38.8(3.6)	6.6
			45.6(1.0)	48.8(1.3)	50.6(1.4)	
PARENTAL EDUCATION						
LESS THAN H.S.	772	93,835(6%)	52.4(2.3)	27.6(2.1)	20.0(1.8)	0.1
			44.6(0.5)	47.1(0.7)	47.0(0.8)	
GRADUATED H.S.	2662	354,369(3%)	24.7(0.8)	34.9(0.9)	40.4(1.0)	0.0
			45.5(0.5)	47.7(0.3)	48.9(0.3)	
SOME EDUC AFTER H.S.	1319	179,590(2%)	17.9(1.0)	32.8(1.5)	49.3(1.5)	0.1
			46.6(0.7)	50.2(0.5)	51.8(0.3)	
GRADUATED COLLEGE	3336	452,268(3%)	11.3(0.7)	26.0(1.0)	62.7(1.4)	0.2
			46.8(0.5)	50.5(0.4)	51.8(0.2)	
UNKNOWN	1291	153,406(4%)	39.5(1.9)	29.6(1.6)	30.9(2.0)	0.1
			43.7(0.5)	46.3(0.4)	47.5(0.6)	

Table 15.79

Weighted Response Percentages and General Reading Proficiency Means, Grade 7

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	9400	1,236,339(1%)	22.6(0.7) 50.3(0.2)	53.8(0.6) 49.6(0.1)	23.6(0.7) 45.6(0.2)	0.8
SEX						
MALE	4753	637,483(1%)	22.1(0.9) 48.9(0.3)	53.0(0.8) 48.4(0.3)	24.9(0.8) 44.3(0.3)	0.9
FEMALE	4647	598,855(1%)	23.2(1.0) 51.6(0.4)	54.6(1.0) 50.9(0.2)	22.2(0.8) 47.2(0.2)	0.6
ETHNICITY/RACE						
WHITE	5539	875,573(1%)	24.3(1.0) 51.6(0.2)	56.8(0.8) 50.7(0.2)	18.8(0.9) 47.3(0.3)	0.7
BLACK	1983	186,400(2%)	13.8(0.9) 45.0(0.6)	43.9(1.6) 46.4(0.3)	42.3(1.5) 44.0(0.4)	0.2
HISPANIC	1597	130,521(2%)	20.9(1.0) 45.5(0.6)	48.6(1.6) 45.5(0.5)	30.6(1.7) 42.0(0.5)	0.4
OTHER	281	43,844(8%)	30.0(3.4) 49.5(1.7)	51.1(3.3) 49.1(1.2)	18.9(3.2) 46.2(1.7)	6.1
PARENTAL EDUCATION						
LESS THAN H.S.	771	93,777(6%)	20.2(1.5) 45.8(0.5)	51.4(1.9) 46.1(0.5)	28.4(2.0) 45.1(0.9)	0.2
GRADUATED H.S.	2658	353,901(3%)	17.3(0.9) 48.4(0.5)	56.4(1.1) 48.6(0.3)	26.3(1.0) 45.1(0.3)	0.1
SOME EDUC AFTER H.S.	1318	179,443(2%)	21.8(1.4) 50.6(0.6)	57.9(1.5) 51.1(0.3)	20.3(1.2) 48.0(0.6)	0.2
GRADUATED COLLEGE	3334	452,108(3%)	28.1(1.4) 52.9(0.3)	52.4(1.0) 51.5(0.2)	19.6(1.0) 46.4(0.4)	0.2
UNKNOWN	1286	152,688(4%)	21.0(1.5) 45.7(0.6)	49.1(1.4) 46.8(0.4)	29.9(1.2) 43.7(0.4)	0.6

Table 15.80

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 7

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	12185	1,596,045(1%)	100.0(0.0) 267.1(0.6)	0.0
SEX				
MALE	6144	810,412(1%)	100.0(0.0) 266.6(0.6)	0.0
FEMALE	6041	785,633(1%)	100.0(0.0) 267.6(0.7)	0.0
ETHNICITY/RACE				
WHITE	7180	1,130,448(1%)	100.0(0.0) 274.0(0.6)	0.0
BLACK	2526	239,023(2%)	100.0(0.0) 245.4(0.8)	0.0
HISPANIC	2027	166,266(1%)	100.0(0.0) 251.3(1.1)	0.0
OTHER	452	60,308(4%)	100.0(0.0) 269.0(7.2)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	1031	125,341(4%)	100.0(0.0) 249.4(0.8)	0.0
GRADUATED H.S.	3358	448,040(3%)	100.0(0.0) 260.5(0.6)	0.0
SOME EDUC AFTER H.S.	1696	231,446(3%)	100.0(0.0) 275.0(0.7)	0.0
GRADUATED COLLEGE	4275	580,293(3%)	100.0(0.0) 278.5(0.9)	0.0
UNKNOWN	1664	196,042(4%)	100.0(0.0) 251.4(1.0)	0.0

Table 15.81

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 7

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	12185	1,596,045(1%)	50.8(0.4) 266.6(0.6)	49.2(0.4) 267.6(0.7)	0.0
SEX					
MALE	6144	810,412(1%)	100.0(0.0) 266.6(0.6)	0.0(0.0) *****(0.0)	0.0
FEMALE	6041	785,633(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 267.6(0.7)	0.0
ETHNICITY/RACE					
WHITE	7180	1,130,448(1%)	50.8(0.5) 273.1(0.7)	49.2(0.5) 274.8(0.8)	0.0
BLACK	2526	239,023(2%)	48.7(1.0) 245.4(0.9)	51.3(1.0) 245.4(1.1)	0.0
HISPANIC	2027	166,266(1%)	53.6(1.2) 251.8(1.4)	46.4(1.2) 250.8(1.3)	0.0
OTHER	452	60,308(4%)	50.1(2.7) 269.0(7.3)	49.9(2.7) 269.1(7.4)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	1031	125,341(4%)	41.1(2.2) 249.8(1.4)	58.9(2.2) 249.2(1.4)	0.0
GRADUATED H.S.	3358	448,040(3%)	49.6(0.9) 259.3(0.8)	50.4(0.9) 261.8(0.7)	0.0
SOME EDUC AFTER H.S.	1696	231,446(3%)	47.5(1.6) 274.0(1.2)	52.5(1.6) 275.9(1.1)	0.0
GRADUATED COLLEGE	4275	580,293(3%)	53.3(0.8) 277.6(1.0)	46.7(0.8) 279.5(1.0)	0.0
UNKNOWN	1664	196,042(4%)	55.7(1.6) 251.9(0.9)	44.3(1.6) 250.8(1.7)	0.0

Table 15.82

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 7

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	12185	1,596,045(1%)	20.8(0.4) 275.3(1.2)	22.9(1.5) 261.3(1.3)	26.7(1.8) 270.6(1.2)	29.6(0.8) 262.8(1.3)	0.0
SEX							
MALE	6144	810,412(1%)	20.7(0.6) 274.6(1.2)	22.3(1.5) 260.7(1.4)	27.6(1.8) 269.8(1.0)	29.4(0.9) 262.5(1.1)	0.0
FEMALE	6041	785,633(1%)	20.9(0.5) 276.0(1.4)	23.5(1.6) 261.8(1.3)	25.7(1.8) 271.4(2.0)	29.9(0.8) 263.2(1.5)	0.0
ETHNICITY/RACE							
WHITE	7180	1,130,448(1%)	22.6(0.3) 280.7(1.3)	21.2(2.1) 269.2(1.5)	31.4(2.2) 274.7(1.2)	24.8(0.4) 270.9(0.7)	0.0
BLACK	2526	239,023(2%)	20.3(0.6) 250.1(2.5)	42.7(0.9) 244.2(1.0)	18.2(3.3) 243.5(1.8)	18.8(3.2) 244.6(2.5)	0.0
HISPANIC	2027	166,266(1%)	10.1(1.7) 260.1(3.0)	10.6(1.7) 247.7(2.2)	11.6(1.9) 253.3(1.9)	67.8(0.8) 250.2(1.6)	0.0
OTHER	452	60,308(4%)	17.4(5.4) 283.1(3.1)	10.5(2.6) 274.7(8.1)	13.8(3.7) 275.6(5.7)	58.3(9.3) 262.2(11.7)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	1031	125,341(4%)	12.9(1.4) 254.0(2.1)	31.3(3.1) 247.2(1.6)	20.2(2.6) 253.7(1.7)	35.6(2.9) 247.3(1.2)	0.0
GRADUATED H.S.	3358	448,040(3%)	19.3(1.2) 268.0(1.3)	24.4(2.1) 256.5(0.7)	30.7(2.4) 263.4(1.8)	25.5(1.0) 255.4(1.1)	0.0
SOME EDUC AFTER H.S.	1696	231,446(3%)	20.0(1.2) 280.0(1.4)	20.3(1.7) 271.2(1.6)	30.6(2.2) 278.1(1.4)	28.6(1.3) 270.9(1.6)	0.0
GRADUATED COLLEGE	4275	580,293(3%)	24.5(1.2) 284.6(1.8)	21.1(1.7) 271.6(2.7)	25.5(2.0) 281.7(1.4)	28.9(1.3) 275.4(1.3)	0.0
UNKNOWN	1664	196,042(4%)	18.7(1.4) 260.3(1.7)	20.1(1.9) 245.3(2.3)	21.6(2.1) 254.0(1.9)	39.6(2.4) 248.9(1.9)	0.0

BEST COPY AVAILABLE

Table 15.83

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 7

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	12185	1,596,045(1%)	70.8(0.3) 274.0(0.6)	15.0(0.2) 245.4(0.8)	10.4(0.2) 251.3(1.1)	1.8(0.4) 288.6(3.8)	1.8(0.4) 248.9(8.3)	0.2(0.2) 270.7(3.8)	0.0
SEX									
MALE	6144	810,412(1%)	70.9(0.4) 273.1(0.7)	14.4(0.3) 245.4(0.9)	11.0(0.3) 251.8(1.4)	1.7(0.4) 290.3(4.3)	1.7(0.4) 247.6(8.5)	0.2(0.2) 269.5(5.6)	0.0
FEMALE	6041	785,633(1%)	70.7(0.5) 274.8(0.8)	15.6(0.4) 245.4(1.1)	9.8(0.3) 250.8(1.3)	1.8(0.4) 287.0(4.6)	1.8(0.5) 250.2(8.9)	0.2(0.2) 272.1(4.2)	0.0
ETHNICITY/RACE									
WHITE	7180	1,130,448(1%)	100.0(0.0) 274.0(0.6)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	2526	239,023(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 245.4(0.8)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	2027	166,266(1%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 251.3(1.1)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	452	60,308(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	47.4(10.5) 288.6(3.8)	46.6(11.5) 248.9(8.3)	5.9(4.7) 270.7(3.8)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	1031	125,341(4%)	59.8(2.3) 254.3(1.3)	14.1(1.1) 235.7(2.3)	21.9(2.1) 244.1(1.5)	1.0(0.4) 266.0(8.2)	3.2(0.8) 251.0(5.8)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	3358	448,040(3%)	71.6(1.1) 266.2(0.9)	15.3(0.6) 244.2(1.1)	10.2(0.4) 249.4(1.2)	0.9(0.3) 252.9(6.3)	2.0(0.9) 241.2(13.9)	0.0(0.0) 262.0(13.5)	0.0
SOME EDUC AFTER H.S.	1696	231,446(3%)	77.2(1.3) 279.6(0.8)	13.5(0.9) 256.6(1.7)	7.4(0.9) 260.0(2.7)	0.9(0.3) 287.8(6.1)	1.0(0.3) 264.7(9.9)	0.0(0.0) 266.1(****)	0.0
GRADUATED COLLEGE	4275	580,293(3%)	75.5(1.1) 285.0(0.8)	14.8(0.7) 248.0(1.5)	5.7(0.4) 263.1(1.9)	2.7(0.6) 302.8(3.2)	1.2(0.2) 262.5(6.1)	0.0(0.0) 281.8(23.7)	0.0
UNKNOWN	1664	196,042(4%)	55.8(1.5) 257.9(1.1)	17.1(0.9) 236.8(1.4)	21.5(1.2) 245.3(1.4)	2.7(0.8) 277.0(3.1)	2.7(1.3) 236.4(9.1)	0.2(0.1) 232.4(10.9)	0.0

Table 15.84

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 7

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	12024	1,581,162(1%)	7.9(0.3)	28.3(0.8)	14.6(0.4)	36.7(1.0)	12.4(0.5)	0.9
			249.4(0.8)	260.5(0.6)	275.0(0.7)	278.5(0.9)	251.4(1.0)	
SEX								
MALE	6053	802,167(1%)	6.4(0.4)	27.7(0.9)	13.7(0.5)	38.6(1.1)	13.6(0.6)	1.0
			249.8(1.4)	259.3(0.8)	274.0(1.2)	277.6(1.0)	251.9(0.9)	
FEMALE	5971	778,994(1%)	9.5(0.6)	29.0(0.9)	15.6(0.7)	34.8(1.1)	11.1(0.6)	0.8
			249.2(1.4)	261.8(0.7)	275.9(1.1)	279.5(1.0)	250.8(1.7)	
ETHNICITY/RACE								
WHITE	7117	1,121,933(1%)	6.7(0.4)	28.6(1.1)	15.9(0.5)	39.1(1.4)	9.7(0.5)	0.6
			254.3(1.3)	266.2(0.9)	279.6(0.8)	285.0(0.8)	257.9(1.1)	
BLACK	2508	237,117(2%)	7.5(0.5)	28.9(1.0)	13.1(0.7)	36.3(1.2)	14.2(0.7)	0.8
			235.7(2.3)	244.2(1.1)	256.6(1.7)	248.0(1.5)	236.8(1.4)	
HISPANIC	2018	165,551(1%)	16.6(1.6)	27.7(0.9)	10.3(1.3)	19.9(1.5)	25.5(1.6)	0.4
			244.1(1.5)	249.4(1.2)	260.0(2.7)	263.1(1.9)	245.3(1.4)	
OTHER	381	56,561(7%)	9.2(1.7)	23.0(5.3)	7.9(1.5)	40.5(7.7)	19.4(3.4)	6.2
			254.5(5.2)	244.9(8.8)	275.3(6.4)	290.6(4.0)	255.8(10.8)	
PARENTAL EDUCATION								
LESS THAN H.S.	1031	125,341(4%)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			249.4(0.8)	*****(0.0)	*****(0.0)	*****(0.0)	*****(0.0)	
GRADUATED H.S.	3358	448,040(3%)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	260.5(0.6)	*****(0.0)	*****(0.0)	*****(0.0)	
SOME EDUC AFTER H.S.	1696	231,446(3%)	0.0(0.0)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	*****(0.0)	275.0(0.7)	*****(0.0)	*****(0.0)	
GRADUATED COLLEGE	4275	580,293(3%)	0.0(0.0)	0.0(0.0)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	*****(0.0)	*****(0.0)	278.5(0.9)	*****(0.0)	
UNKNOWN	1664	196,042(4%)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	100.0(0.0)	0.0
			*****(0.0)	*****(0.0)	*****(0.0)	*****(0.0)	251.4(1.0)	

Table 15.85

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 7

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	12025	1,581,005(1%)	23.1(0.6) 251.4(0.7)	28.9(0.6) 266.1(0.6)	48.0(0.9) 275.5(0.7)	0.9
SEX						
MALE	6051	801,662(1%)	23.7(0.8) 252.0(0.8)	28.3(0.7) 264.7(0.8)	48.0(1.1) 275.2(0.8)	1.1
FEMALE	5974	779,343(1%)	22.4(0.7) 250.8(1.2)	29.6(0.9) 267.5(0.8)	48.1(1.1) 275.7(0.8)	0.8
ETHNICITY/RACE						
WHITE	7117	1,121,917(1%)	17.5(0.8) 259.1(1.0)	28.7(0.7) 272.0(0.8)	53.9(1.1) 280.0(0.7)	0.8
BLACK	2511	237,518(2%)	31.0(1.4) 238.8(1.0)	31.9(0.9) 246.7(1.3)	37.0(1.4) 249.9(1.3)	0.6
HISPANIC	2012	164,746(1%)	46.0(1.9) 244.1(1.2)	26.3(1.3) 254.4(1.6)	27.7(1.6) 260.8(1.3)	0.9
OTHER	385	56,825(7%)	33.8(7.7) 250.2(10.0)	28.4(5.1) 272.1(5.1)	37.8(3.9) 282.6(6.1)	5.8
PARENTAL EDUCATION						
LESS THAN H.S.	1028	124,464(4%)	47.6(1.8) 244.5(1.7)	29.1(1.7) 252.6(1.7)	23.3(1.6) 255.9(1.5)	0.7
GRADUATED H.S.	3353	447,325(3%)	27.2(0.9) 249.8(1.3)	32.0(1.0) 260.9(1.3)	40.8(1.1) 267.3(0.9)	0.2
SOME EDUC AFTER H.S.	1690	230,882(3%)	17.0(1.0) 261.7(1.4)	30.6(1.0) 274.5(1.4)	52.4(1.3) 279.6(0.9)	0.2
GRADUATED COLLEGE	4268	579,730(3%)	11.6(0.6) 262.8(1.7)	25.5(0.7) 275.5(1.2)	62.9(1.0) 282.7(0.9)	0.1
UNKNOWN	1663	195,978(4%)	38.8(1.8) 244.2(1.3)	29.7(1.3) 253.7(1.3)	31.5(2.3) 258.2(1.9)	0.0

Table 15.86

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 7

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	12042	1,583,123(1%)	22.5(0.8) 273.9(1.5)	53.0(0.6) 270.6(0.6)	24.4(0.6) 253.6(0.6)	0.8
SEX						
MALE	6056	802,556(1%)	22.5(0.8) 273.2(1.7)	51.7(0.9) 270.5(0.8)	25.8(0.9) 253.6(0.8)	1.0
FEMALE	5986	780,567(1%)	22.6(1.0) 274.7(1.6)	54.4(1.0) 270.7(0.7)	23.0(0.7) 253.6(0.9)	0.6
ETHNICITY/RACE						
WHITE	7128	1,122,981(1%)	24.3(0.9) 280.0(1.0)	56.1(0.6) 275.9(0.7)	19.6(0.7) 261.4(1.0)	0.7
BLACK	2514	237,738(2%)	11.2(0.8) 244.7(1.6)	43.3(1.5) 249.8(1.1)	45.5(1.3) 241.5(0.9)	0.5
HISPANIC	2016	165,633(1%)	22.7(1.1) 251.7(2.1)	49.3(1.1) 255.0(1.5)	28.0(1.2) 244.5(1.4)	0.4
OTHER	384	56,772(7%)	35.2(5.0) 271.5(16.6)	44.2(4.0) 272.9(4.6)	20.6(2.1) 256.1(5.1)	5.9
PARENTAL EDUCATION						
LESS THAN H.S.	1026	124,978(4%)	18.2(1.4) 249.9(1.9)	50.2(1.4) 252.1(1.1)	31.6(2.0) 244.9(2.0)	0.3
GRADUATED H.S.	3352	447,183(3%)	19.2(1.2) 263.2(1.7)	54.0(1.3) 264.0(0.8)	26.8(0.7) 251.7(1.3)	0.2
SOME EDUC AFTER H.S.	1690	230,913(3%)	20.4(1.1) 278.9(1.4)	58.5(1.0) 277.3(0.9)	21.1(0.7) 264.9(1.8)	0.2
GRADUATED COLLEGE	4262	578,899(3%)	27.8(1.0) 287.4(1.4)	53.6(0.9) 280.5(0.9)	18.6(1.0) 259.8(1.1)	0.2
UNKNOWN	1657	195,035(4%)	19.8(2.2) 250.5(2.9)	45.0(1.7) 257.1(1.0)	35.1(1.4) 244.8(1.4)	0.5

Table 15.87

Weighted Response Percentages and General Science Proficiency Means, Grade 7

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	12142	1,590,825(1%)	100.0(0.0) 248.7(0.7)	0.0
SEX				
MALE	6149	812,617(1%)	100.0(0.0) 252.3(0.8)	0.0
FEMALE	5993	778,209(1%)	100.0(0.0) 244.9(0.7)	0.0
ETHNICITY/RACE				
WHITE	7213	1,132,765(1%)	100.0(0.0) 259.3(0.7)	0.0
BLACK	2495	236,338(1%)	100.0(0.0) 216.8(1.3)	0.0
HISPANIC	1998	162,480(1%)	100.0(0.0) 222.0(1.4)	0.0
OTHER	436	59,242(4%)	100.0(0.0) 244.4(7.4)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	1027	126,669(5%)	100.0(0.0) 224.3(1.1)	0.0
GRADUATED H.S.	3370	450,091(3%)	100.0(0.0) 240.8(0.8)	0.0
SOME EDUC AFTER H.S.	1725	237,057(2%)	100.0(0.0) 258.9(1.0)	0.0
GRADUATED COLLEGE	4256	573,409(3%)	100.0(0.0) 262.9(0.9)	0.0
UNKNOWN	1605	189,124(4%)	100.0(0.0) 228.8(1.5)	0.0

Table 15.88

Weighted Response Percentages and General Science Proficiency Means, Grade 7

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	12142	1,590,825(1%)	51.1(0.5) 252.3(0.8)	48.9(0.5) 244.9(0.7)	0.0
SEX					
MALE	6149	812,617(1%)	100.0(0.0) 252.3(0.8)	0.0(0.0) *****(0.0)	0.0
FEMALE	5993	778,209(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 244.9(0.7)	0.0
ETHNICITY/RACE					
WHITE	7213	1,132,765(1%)	50.9(0.6) 262.9(0.8)	49.1(0.6) 255.7(0.9)	0.0
BLACK	2495	236,338(1%)	50.0(1.2) 220.0(1.4)	50.0(1.2) 213.7(1.4)	0.0
HISPANIC	1998	162,480(1%)	52.3(1.2) 225.2(1.3)	47.7(1.2) 218.5(2.1)	0.0
OTHER	436	59,242(4%)	56.4(2.3) 252.1(7.4)	43.6(2.3) 234.4(7.7)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	1027	126,669(5%)	40.2(2.0) 228.6(1.9)	59.8(2.0) 221.4(1.6)	0.0
GRADUATED H.S.	3370	450,091(3%)	48.8(1.0) 242.6(1.0)	51.2(1.0) 239.1(0.9)	0.0
SOME EDUC AFTER H.S.	1725	237,057(2%)	48.7(1.3) 261.7(1.5)	51.3(1.3) 256.3(1.5)	0.0
GRADUATED COLLEGE	4256	573,409(3%)	54.3(0.7) 266.1(1.0)	45.7(0.7) 259.1(1.1)	0.0
UNKNOWN	1605	189,124(4%)	56.3(1.2) 234.0(1.8)	43.7(1.2) 222.0(1.8)	0.0

Table 15.89

Weighted Response Percentages and General Science Proficiency Means, Grade 7

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	12142	1,590,825(1%)	21.0(0.4) 255.4(1.4)	23.1(1.4) 242.8(1.6)	26.7(1.8) 255.1(1.5)	29.2(0.7) 242.5(1.7)	0.0
SEX							
MALE	6149	812,617(1%)	20.9(0.6) 258.1(1.8)	22.4(1.5) 246.7(2.0)	27.3(1.9) 258.1(1.3)	29.3(0.7) 246.9(1.9)	0.0
FEMALE	5993	778,209(1%)	21.1(0.7) 252.7(1.7)	23.7(1.6) 238.9(1.5)	26.1(1.7) 251.9(1.8)	29.0(0.9) 237.8(1.7)	0.0
ETHNICITY/RACE							
WHITE	7213	1,132,765(1%)	22.8(0.3) 263.5(1.6)	21.7(2.0) 255.1(1.4)	31.2(2.1) 261.4(1.3)	24.3(0.3) 256.6(1.5)	0.0
BLACK	2495	236,338(1%)	20.9(0.5) 221.3(2.9)	41.4(0.6) 214.4(2.1)	19.0(3.3) 218.4(3.2)	18.7(3.3) 215.7(3.3)	0.0
HISPANIC	1998	162,480(1%)	9.5(1.9) 222.4(3.4)	10.5(1.4) 225.7(3.0)	10.9(2.0) 227.8(2.1)	69.1(0.7) 220.5(1.9)	0.0
OTHER	436	59,242(4%)	19.2(6.9) 263.8(5.9)	10.7(3.8) 250.6(6.4)	15.9(4.3) 248.3(8.4)	54.1(10.9) 235.1(12.0)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	1027	126,669(5%)	13.4(2.4) 227.2(3.2)	31.5(3.3) 224.4(2.1)	21.4(3.1) 228.5(2.8)	33.6(2.9) 220.3(2.2)	0.0
GRADUATED H.S.	3370	450,091(3%)	19.7(1.5) 246.7(2.0)	24.9(1.8) 236.5(1.1)	30.7(2.2) 247.0(1.5)	24.7(1.1) 232.8(2.4)	0.0
SOME EDUC AFTER H.S.	1725	237,057(2%)	18.9(1.1) 261.4(2.0)	21.4(1.5) 254.9(1.3)	30.1(2.3) 262.8(1.8)	29.6(1.3) 256.4(2.4)	0.0
GRADUATED COLLEGE	4256	573,409(3%)	24.8(1.3) 268.2(2.1)	21.4(1.7) 255.9(2.8)	26.0(1.9) 269.4(1.6)	27.8(1.3) 257.5(1.4)	0.0
UNKNOWN	1605	189,124(4%)	19.7(1.7) 234.9(2.2)	18.5(2.0) 222.2(2.7)	19.9(2.1) 234.5(3.1)	42.0(2.2) 226.1(2.7)	0.0

Table 15.90

Weighted Response Percentages and General Science Proficiency Means, Grade 7

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	12142	1,590,825(1%)	71.2(0.3) 259.3(0.7)	14.9(0.2) 216.8(1.3)	10.2(0.1) 222.0(1.4)	1.7(0.4) 259.9(4.5)	1.8(0.5) 228.9(9.5)	0.2(0.2) 247.5(1.4)	0.0
SEX									
MALE	6149	812,617(1%)	70.9(0.6) 262.9(0.8)	14.5(0.4) 220.0(1.4)	10.5(0.3) 225.2(1.3)	1.9(0.5) 271.1(6.0)	1.9(0.5) 232.5(7.1)	0.3(0.2) 254.1(2.1)	0.0
FEMALE	5993	778,209(1%)	71.5(0.5) 255.7(0.9)	15.2(0.4) 213.7(1.4)	10.0(0.3) 218.5(2.1)	1.5(0.3) 244.7(5.7)	1.6(0.5) 224.3(13.7)	0.2(0.2) 239.4(2.6)	0.0
ETHNICITY/RACE									
WHITE	7213	1,132,765(1%)	100.0(0.0) 259.3(0.7)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	2495	236,338(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 216.8(1.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	1998	162,480(1%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 222.0(1.4)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	436	59,242(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	46.1(11.0) 259.9(4.5)	47.4(12.1) 228.9(9.5)	6.5(5.4) 247.5(1.4)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	1027	126,669(5%)	61.1(2.3) 235.5(1.6)	13.2(1.2) 196.8(1.7)	22.3(2.0) 211.0(3.1)	0.7(0.4) 189.1(15.7)	2.6(0.6) 223.7(8.8)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	3370	450,091(3%)	72.0(1.2) 250.5(0.8)	14.9(0.6) 210.9(1.6)	10.2(0.6) 222.1(1.4)	0.7(0.3) 224.8(7.9)	2.1(1.0) 217.2(20.4)	0.0(0.0) 263.5(18.8)	0.0
SOME EDUC AFTER H.S.	1725	237,057(2%)	77.1(1.1) 266.0(1.2)	13.7(0.9) 231.7(2.5)	6.6(0.5) 237.6(1.8)	1.0(0.3) 261.3(10.2)	1.6(0.4) 239.2(10.6)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	4256	573,409(3%)	75.9(1.1) 272.2(0.8)	14.9(0.7) 224.8(1.4)	5.5(0.4) 234.0(2.1)	2.5(0.6) 277.6(4.7)	1.2(0.2) 248.9(5.1)	0.0(0.0) 245.4(7.5)	0.0
UNKNOWN	1605	189,124(4%)	55.5(1.8) 241.1(1.7)	17.4(1.1) 204.9(2.0)	21.4(1.4) 214.3(1.8)	3.3(0.9) 248.5(8.2)	2.2(1.4) 218.2(5.8)	0.1(0.1) 229.0(15.1)	0.0

424 425

Table 15.91

Weighted Response Percentages and General Science Proficiency Means, Grade 7

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	11983	1,576,350(1%)	8.0(0.4) 224.3(1.1)	28.6(0.8) 240.8(0.8)	15.0(0.4) 258.9(1.0)	36.4(0.9) 262.9(0.9)	12.0(0.4) 228.8(1.5)	0.9
SEX								
MALE	6054	803,707(1%)	6.3(0.4) 228.6(1.9)	27.3(1.0) 242.6(1.0)	14.4(0.5) 261.7(1.5)	38.7(1.0) 266.1(1.0)	13.2(0.6) 234.0(1.8)	1.1
FEMALE	5929	772,644(1%)	9.8(0.6) 221.4(1.6)	29.8(0.9) 239.1(0.9)	15.7(0.6) 256.3(1.5)	33.9(1.0) 259.1(1.1)	10.7(0.4) 222.0(1.8)	0.7
ETHNICITY/RACE								
WHITE	7152	1,124,574(1%)	6.9(0.5) 235.5(1.6)	28.8(1.1) 250.5(0.8)	16.2(0.5) 266.0(1.2)	38.7(1.3) 272.2(0.8)	9.3(0.4) 241.1(1.7)	0.7
BLACK	2480	234,567(1%)	7.1(0.7) 196.8(1.7)	28.6(1.1) 210.9(1.6)	13.8(1.0) 231.7(2.5)	36.4(1.3) 224.8(1.4)	14.1(0.9) 204.9(2.0)	0.7
HISPANIC	1990	161,817(1%)	17.5(1.8) 211.0(3.1)	28.3(1.3) 222.1(1.4)	9.7(0.8) 237.6(1.8)	19.6(1.4) 234.0(2.1)	25.0(1.8) 214.3(1.8)	0.4
OTHER	361	55,393(7%)	7.7(1.9) 216.1(7.4)	23.4(6.9) 219.5(12.2)	11.3(1.8) 248.0(7.3)	38.3(7.8) 268.2(4.1)	19.4(2.8) 236.2(9.9)	6.5
PARENTAL EDUCATION								
LESS THAN H.S.	1027	126,669(5%)	100.0(0.0) 224.3(1.1)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	3370	450,091(3%)	0.0(0.0) *****(0.0)	100.0(0.0) 240.8(0.8)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	1725	237,057(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 258.9(1.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	4256	573,409(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 262.9(0.9)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	1605	189,124(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 228.8(1.5)	0.0

Table 15.92

Weighted Response Percentages and General Science Proficiency Means, Grade 7

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	11990	1,577,445(1%)	22.5(0.7) 226.7(0.8)	29.3(0.6) 247.4(0.8)	48.2(0.8) 259.9(0.7)	0.8
SEX						
MALE	6058	804,646(1%)	22.9(0.8) 230.3(1.2)	29.3(0.8) 250.1(1.0)	47.8(1.0) 264.4(0.9)	1.0
FEMALE	5932	772,799(1%)	22.1(0.8) 222.8(1.1)	29.2(0.7) 244.5(1.0)	48.7(0.9) 255.4(1.1)	0.7
ETHNICITY/RACE						
WHITE	7154	1,124,811(1%)	16.7(0.7) 240.1(1.3)	28.9(0.7) 257.1(0.9)	54.4(1.0) 266.7(0.7)	0.7
BLACK	2485	235,289(1%)	31.6(1.5) 206.5(1.3)	31.4(1.1) 218.4(1.6)	36.9(1.2) 224.6(1.5)	0.4
HISPANIC	1988	161,813(1%)	45.2(1.7) 213.0(1.9)	29.1(1.3) 225.8(1.9)	25.8(1.4) 233.8(1.9)	0.4
OTHER	363	55,532(7%)	35.3(5.8) 226.4(4.4)	28.4(3.3) 246.1(7.7)	36.3(4.0) 260.4(9.4)	6.3
PARENTAL EDUCATION						
LESS THAN H.S.	1025	126,441(5%)	49.3(2.1) 216.0(1.5)	28.6(1.5) 229.7(2.4)	22.1(1.6) 235.9(2.0)	0.2
GRADUATED H.S.	3365	449,349(3%)	25.3(1.0) 226.7(1.5)	33.6(0.9) 241.0(1.2)	41.1(0.9) 249.4(0.9)	0.2
SOME EDUC AFTER H.S.	1720	236,530(2%)	16.9(1.0) 241.7(2.1)	30.6(1.2) 257.7(1.7)	52.6(1.3) 265.2(1.2)	0.2
GRADUATED COLLEGE	4254	573,237(3%)	11.1(0.7) 239.4(1.9)	25.9(0.7) 258.8(1.3)	63.0(0.9) 268.8(0.9)	0.0
UNKNOWN	1604	189,014(4%)	39.4(1.9) 217.0(1.2)	28.1(1.3) 231.7(2.2)	32.5(1.7) 240.6(3.1)	0.1

Table 15.93

Weighted Response Percentages and General Science Proficiency Means, Grade 7

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	11985	1,576,110(1%)	22.6(0.7) 256.2(1.7)	53.6(0.5) 253.[illegible] 0.7)	23.8(0.6) 232.2(0.9)	0.9
SEX						
MALE	6051	802,881(1%)	22.7(0.9) 260.4(1.9)	52.[illegible](0.9) 256.9(1.0)	25.1(0.9) 236.1(1.1)	1.2
FEMALE	5934	773,228(1%)	22.6(0.8) 251.8(2.0)	55.0(0.7) 249.3(0.7)	22.4(0.5) 227.7(1.0)	0.6
ETHNICITY/RACE						
WHITE	7159	1,124,585(1%)	24.5(0.9) 265.0(1.2)	56.5(0.6) 261.7(0.8)	18.9(0.7) 246.1(1.3)	0.7
BLACK	2480	234,872(1%)	11.3(0.6) 216.0(2.3)	43.3(1.4) 223.0(1.5)	45.4(1.3) 211.4(1.4)	0.6
HISPANIC	1986	161,733(1%)	21.1(1.3) 222.5(2.9)	50.5(1.0) 226.1(1.3)	28.4(1.3) 214.4(2.0)	0.5
OTHER	360	54,920(7%)	36.4(4.2) 245.0(14.3)	46.3(2.8) 244.0(6.8)	17.4(3.7) 241.4(7.2)	7.3
PARENTAL EDUCATION						
LESS THAN H.S.	1021	126,132(5%)	17.4(1.3) 221.5(2.3)	53.0(2.0) 229.4(1.6)	29.6(1.7) 217.1(2.0)	0.4
GRADUATED H.S.	3361	448,367(3%)	18.2(1.0) 243.6(1.9)	55.5(0.9) 245.5(0.9)	26.2(0.8) 229.4(1.6)	0.4
SOME EDUC AFTER H.S.	1717	236,036(2%)	19.8(1.1) 261.8(2.4)	60.0(1.2) 262.5(1.3)	20.1(1.0) 245.8(2.2)	0.4
GRADUATED COLLEGE	4242	571,688(3%)	29.1(0.9) 272.3(1.3)	52.0(0.9) 265.4(1.2)	18.9(1.0) 241.7(1.6)	0.3
UNKNOWN	1597	188,141(4%)	20.3(2.0) 226.7(4.5)	46.3(1.5) 236.0(1.9)	33.4(1.5) 220.2(1.6)	0.5

Table 15.94

Weighted Response Percentages and General Reading Proficiency Means, Grade 11

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	16510	1,638,151(0%)	100.0(0.0) 56.0(0.2)	0.0
SEX				
MALE	8202	829,034(2%)	100.0(0.0) 54.4(0.3)	0.0
FEMALE	8308	809,117(1%)	100.0(0.0) 57.7(0.2)	0.0
ETHNICITY/RACE				
WHITE	11653	1,246,798(0%)	100.0(0.0) 57.3(0.2)	0.0
BLACK	2741	220,220(2%)	100.0(0.0) 51.3(0.3)	0.0
HISPANIC	1645	118,502(2%)	100.0(0.0) 51.3(0.3)	0.0
OTHER	471	52,631(5%)	100.0(0.0) 56.1(1.4)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	1461	130,350(5%)	100.0(0.0) 51.6(0.3)	0.0
GRADUATED H.S.	4546	441,638(3%)	100.0(0.0) 53.4(0.2)	0.0
SOME EDUC AFTER H.S.	3649	359,285(2%)	100.0(0.0) 56.9(0.2)	0.0
GRADUATED COLLEGE	6189	642,424(3%)	100.0(0.0) 58.9(0.3)	0.0
UNKNOWN	581	54,591(5%)	100.0(0.0) 48.8(0.5)	0.0

Table 15.95

Weighted Response Percentages and General Reading Proficiency Means, Grade 11

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	16510	1,638,151(0%)	50.6(0.7) 54.4(0.3)	49.4(0.7) 57.7(0.2)	0.0
SEX					
MALE	8202	829,034(2%)	100.0(0.0) 54.4(0.3)	0.0(0.0) *****(0.0)	0.0
FEMALE	8308	809,117(1%)	0.0(0.0) *****(0.0)	100.0(0.0) 57.7(0.2)	0.0
ETHNICITY/RACE					
WHITE	11653	1,246,798(0%)	50.4(0.8) 55.5(0.3)	49.6(0.8) 59.1(0.2)	0.0
BLACK	2741	220,220(2%)	50.3(1.6) 50.3(0.4)	49.7(1.6) 52.3(0.3)	0.0
HISPANIC	1645	118,502(2%)	51.4(1.8) 49.6(0.4)	48.6(1.8) 53.1(0.4)	0.0
OTHER	471	52,631(5%)	55.5(3.9) 55.1(1.6)	44.5(3.9) 57.4(1.5)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	1461	130,350(5%)	43.3(1.3) 49.9(0.5)	56.7(1.3) 52.9(0.5)	0.0
GRADUATED H.S.	4546	441,638(3%)	50.2(1.0) 51.6(0.3)	49.8(1.0) 55.3(0.3)	0.0
SOME EDUC AFTER H.S.	3649	359,285(2%)	49.4(0.9) 55.4(0.3)	50.6(0.9) 58.4(0.3)	0.0
GRADUATED COLLEGE	6189	642,424(3%)	51.6(1.1) 57.4(0.4)	48.4(1.1) 60.5(0.3)	0.0
UNKNOWN	581	54,591(5%)	66.5(2.9) 47.7(0.6)	33.5(2.9) 51.0(0.8)	0.0

Table 15.96

Weighted Response Percentages and General Reading Proficiency Means, Grade 11

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	16510	1,638,151(0%)	24.1(0.3) 57.3(0.5)	20.7(1.4) 54.7(0.3)	28.6(1.5) 56.4(0.5)	26.6(0.5) 55.4(0.4)	0.0
SEX							
MALE	8202	829,034(2%)	24.2(1.0) 56.2(0.8)	20.3(1.4) 52.7(0.5)	28.4(1.4) 54.6(0.6)	27.2(0.8) 53.8(0.4)	0.0
FEMALE	8308	809,117(1%)	24.0(1.0) 58.5(0.3)	21.1(1.7) 56.6(0.3)	28.9(1.8) 58.2(0.5)	26.1(0.7) 57.2(0.5)	0.0
ETHNICITY/RACE							
WHITE	11653	1,246,798(0%)	25.4(0.2) 58.3(0.6)	19.2(1.8) 56.6(0.3)	32.7(1.8) 57.1(0.5)	22.7(0.2) 56.9(0.4)	0.0
BLACK	2741	220,220(2%)	24.4(0.8) 52.6(0.7)	40.3(0.9) 49.9(0.4)	19.0(2.5) 51.8(0.9)	16.3(2.6) 52.3(0.8)	0.0
HISPANIC	1645	118,502(2%)	13.1(2.0) 52.4(0.8)	6.4(1.2) 48.5(1.2)	11.7(2.6) 50.3(1.5)	68.8(0.9) 51.5(0.3)	0.0
OTHER	471	52,631(5%)	16.2(5.8) 58.8(1.3)	6.6(1.5) 54.8(2.4)	9.1(2.2) 53.8(1.8)	68.2(6.6) 56.0(1.9)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	1461	130,350(5%)	20.7(2.0) 54.1(0.8)	29.8(3.2) 50.8(0.6)	19.2(2.7) 51.4(0.8)	30.3(2.8) 50.8(0.3)	0.0
GRADUATED H.S.	4546	441,638(3%)	23.6(1.4) 54.3(0.5)	22.7(2.3) 52.2(0.6)	32.5(2.4) 54.0(0.5)	21.1(1.1) 52.8(0.2)	0.0
SOME EDUC AFTER H.S.	3649	359,285(2%)	22.0(1.4) 57.3(0.6)	19.4(1.5) 56.5(0.6)	31.5(2.1) 57.3(0.3)	27.0(1.1) 56.4(0.3)	0.0
GRADUATED COLLEGE	6189	642,424(3%)	26.7(1.9) 60.1(0.6)	18.0(1.3) 57.8(0.3)	27.0(2.1) 59.0(0.4)	28.4(1.7) 58.3(0.5)	0.0
UNKNOWN	581	54,591(5%)	20.9(3.0) 51.5(0.9)	18.5(2.5) 47.6(1.0)	21.8(3.1) 49.2(1.3)	38.8(2.8) 47.6(0.8)	0.0

Table 15.97

Weighted Response Percentages and General Reading Proficiency Means, Grade 11

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	16510	1,638,151(0%)	76.1(0.3) 57.3(0.2)	13.4(0.2) 51.3(0.3)	7.2(0.1) 51.3(0.3)	2.3(0.3) 57.7(1.5)	0.9(0.2) 52.5(1.3)	0.0(0.0) 38.9(3.5)	0.0
SEX									
MALE	8202	829,034(2%)	75.8(0.6) 55.5(0.3)	13.4(0.4) 50.3(0.4)	7.4(0.3) 49.6(0.4)	2.6(0.5) 56.4(1.7)	0.9(0.3) 51.3(1.2)	0.0(0.0) 38.9(3.5)	0.0
FEMALE	8308	809,117(1%)	76.5(0.6) 59.1(0.2)	13.5(0.4) 52.3(0.3)	7.1(0.3) 53.1(0.4)	1.9(0.3) 59.5(1.9)	1.0(0.2) 53.6(1.5)	0.0(0.0) *****(0.0)	0.0
ETHNICITY/RACE									
WHITE	11653	1,246,798(0%)	100.0(0.0) 57.3(0.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	2741	220,220(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 51.3(0.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	1645	118,502(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 51.3(0.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	471	52,631(5%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	70.8(7.6) 57.7(1.5)	29.1(7.6) 52.5(1.3)	0.1(0.1) 38.9(3.5)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	1461	130,350(5%)	56.8(2.6) 53.5(0.4)	18.4(1.7) 48.6(0.6)	21.4(2.1) 49.5(0.6)	1.4(0.4) 49.2(2.5)	1.9(0.8) 49.5(1.7)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	4546	441,638(3%)	76.2(0.8) 54.6(0.3)	15.1(0.7) 49.4(0.3)	7.0(0.5) 49.7(0.5)	0.7(0.2) 54.8(2.1)	0.9(0.3) 52.3(1.3)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	3649	359,285(2%)	79.3(0.8) 57.7(0.3)	12.8(0.6) 53.2(0.5)	5.9(0.4) 54.3(0.7)	1.2(0.3) 57.0(2.5)	0.9(0.1) 54.4(2.3)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	6189	642,424(3%)	80.9(0.8) 59.8(0.3)	10.8(0.4) 53.5(0.6)	4.0(0.3) 54.4(0.6)	3.8(0.7) 60.1(1.4)	0.5(0.1) 55.3(2.4)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	581	54,591(5%)	42.9(2.4) 49.8(0.9)	25.0(2.5) 47.8(0.6)	22.6(1.9) 47.8(0.8)	6.2(1.8) 48.4(2.7)	3.2(1.5) 50.2(2.2)	0.1(0.1) 38.9(3.5)	0.0

Table 15.98

Weighted Response Percentages and General Reading Proficiency Means, Grade 11

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	16426	1,628,289(0%)	8.0(0.4) 51.6(0.3)	27.1(0.8) 53.4(0.2)	22.1(0.5) 56.9(0.2)	39.5(1.3) 58.9(0.3)	3.4(0.2) 48.8(0.5)	0.6
SEX								
MALE	8152	823,461(2%)	6.9(0.4) 49.9(0.5)	26.9(1.0) 51.6(0.3)	21.5(0.7) 55.4(0.3)	40.2(1.5) 57.4(0.4)	4.4(0.3) 47.7(0.6)	0.7
FEMALE	8274	804,828(2%)	9.2(0.5) 52.9(0.5)	27.3(0.9) 55.3(0.3)	22.6(0.6) 58.4(0.3)	38.6(1.3) 60.5(0.3)	2.3(0.2) 51.0(0.8)	0.5
ETHNICITY/RACE								
WHITE	11586	1,238,250(1%)	6.0(0.5) 53.5(0.4)	27.2(0.9) 54.6(0.3)	23.0(0.7) 57.7(0.3)	42.0(1.4) 59.8(0.3)	1.9(0.2) 49.8(0.9)	0.7
BLACK	2730	219,448(2%)	10.9(0.9) 48.6(0.6)	30.5(1.3) 49.4(0.3)	20.9(1.0) 53.2(0.5)	31.5(1.4) 53.5(0.6)	6.2(0.7) 47.8(0.6)	0.4
HISPANIC	1640	118,198(2%)	23.7(2.2) 49.5(0.6)	26.2(1.8) 49.7(0.5)	17.9(1.1) 54.3(0.7)	21.8(1.3) 54.4(0.6)	10.5(0.9) 47.8(0.8)	0.3
OTHER	470	52,392(6%)	8.4(2.2) 49.4(1.5)	14.3(2.6) 53.4(1.0)	14.0(2.5) 55.9(2.0)	53.5(6.6) 59.5(1.3)	9.9(2.0) 48.9(2.0)	0.5
PARENTAL EDUCATION								
LESS THAN H.S.	1461	130,350(5%)	100.0(0.0) 51.6(0.3)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	4546	441,638(3%)	0.0(0.0) *****(0.0)	100.0(0.0) 53.4(0.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	3649	359,285(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 56.9(0.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	6189	642,424(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 58.9(0.3)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	581	54,591(5%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 48.8(0.5)	0.0

Table 15.99

Weighted Response Percentages and General Reading Proficiency Means, Grade 11

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	16441	1,630,126(0%)	13.4(0.4)	24.4(0.4)	62.1(0.5)	0.5
			50.8(0.3)	54.8(0.3)	57.7(0.2)	
SEX						
MALE	8159	823,919(2%)	14.0(0.5)	24.3(0.5)	61.7(0.8)	0.6
			49.1(0.4)	53.3(0.3)	56.1(0.3)	
FEMALE	8282	806,207(1%)	12.8(0.5)	24.6(0.5)	62.6(0.6)	0.4
			52.6(0.4)	56.3(0.4)	59.3(0.2)	
ETHNICITY/RACE						
WHITE	11599	1,239,998(1%)	9.6(0.4)	23.0(0.5)	67.4(0.7)	0.5
			52.6(0.4)	56.0(0.3)	58.5(0.2)	
BLACK	2733	219,635(2%)	21.5(1.1)	28.9(1.0)	49.6(1.1)	0.3
			48.2(0.5)	50.9(0.5)	52.9(0.5)	
HISPANIC	1640	118,158(2%)	32.5(1.6)	30.1(1.3)	37.4(1.8)	0.3
			47.9(0.5)	52.0(0.5)	53.6(0.5)	
OTHER	469	52,334(6%)	25.5(2.3)	27.4(2.1)	47.1(2.3)	0.6
			51.6(1.3)	55.9(1.5)	58.9(1.6)	
PARENTAL EDUCATION						
LESS THAN H.S.	1459	130,173(5%)	35.0(1.5)	31.0(1.6)	34.0(1.4)	0.1
			49.4(0.5)	52.2(0.5)	53.4(0.5)	
GRADUATED H.S.	4543	441,421(3%)	16.5(0.5)	29.3(1.0)	54.2(1.0)	0.0
			50.0(0.5)	52.7(0.3)	54.8(0.3)	
SOME EDUC AFTER H.S.	3648	359,158(2%)	10.8(0.6)	24.1(0.7)	65.2(0.7)	0.0
			53.7(0.7)	56.3(0.4)	57.7(0.3)	
GRADUATED COLLEGE	6186	642,058(3%)	6.2(0.4)	19.6(0.6)	74.1(0.7)	0.1
			53.1(0.6)	57.5(0.4)	59.7(0.3)	
UNKNOWN	578	54,216(5%)	37.6(2.6)	28.1(2.0)	34.3(2.3)	0.7
			46.5(0.9)	49.1(0.8)	51.2(0.8)	

Table 15.100

Weighted Response Percentages and General Reading Proficiency Means, Grade 11

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	16455	1,631,411(0%)	46.9(0.8) 57.8(0.2)	43.8(0.7) 55.2(0.2)	9.3(0.3) 50.9(0.3)	0.4
SEX						
MALE	8166	824,665(2%)	45.8(0.9) 56.0(0.3)	44.0(0.9) 53.9(0.3)	10.3(0.4) 49.7(0.5)	0.5
FEMALE	8289	806,746(2%)	48.0(1.0) 59.6(0.3)	43.6(0.8) 56.6(0.2)	8.4(0.4) 52.4(0.4)	0.3
ETHNICITY/RACE						
WHITE	11604	1,240,604(1%)	51.8(1.0) 58.7(0.3)	41.5(0.9) 56.5(0.2)	6.7(0.4) 52.2(0.5)	0.5
BLACK	2740	220,144(2%)	22.8(0.8) 52.2(0.7)	53.4(0.9) 51.6(0.4)	23.7(1.1) 49.8(0.4)	0.0
HISPANIC	1642	118,351(2%)	40.8(1.4) 52.1(0.5)	48.3(1.6) 51.5(0.3)	10.9(1.1) 47.7(1.0)	0.1
OTHER	469	52,311(6%)	44.9(2.5) 57.7(1.5)	47.3(2.8) 56.0(1.5)	7.8(1.6) 49.9(1.6)	0.6
PARENTAL EDUCATION						
LESS THAN H.S.	1460	130,315(5%)	35.7(1.7) 52.7(0.5)	49.9(2.0) 51.6(0.5)	14.3(1.3) 48.9(0.8)	0.0
GRADUATED H.S.	4543	441,306(3%)	37.4(0.9) 54.6(0.3)	50.5(0.8) 53.4(0.3)	12.1(0.4) 50.0(0.5)	0.1
SOME EDUC AFTER H.S.	3645	358,912(2%)	46.4(1.2) 58.1(0.3)	45.1(1.0) 56.4(0.3)	8.4(0.6) 53.4(0.7)	0.1
GRADUATED COLLEGE	6186	642,199(3%)	56.9(1.1) 60.2(0.3)	37.2(1.0) 57.8(0.3)	5.9(0.4) 52.8(0.5)	0.0
UNKNOWN	577	54,217(5%)	35.4(1.7) 49.2(0.8)	44.4(2.2) 49.5(0.9)	20.2(1.7) 46.5(1.1)	0.7

Table 15.101

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 11

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	11850	1,190,734(1%)	100.0(0.0) 304.0(0.7)	0.0
SEX				
MALE	5840	599,642(2%)	100.0(0.0) 306.1(1.0)	0.0
FEMALE	6010	591,093(2%)	100.0(0.0) 301.8(0.8)	0.0
ETHNICITY/RACE				
WHITE	8389	904,251(1%)	100.0(0.0) 309.4(0.7)	0.0
BLACK	1918	156,313(2%)	100.0(0.0) 279.2(1.2)	0.0
HISPANIC	1185	88,829(3%)	100.0(0.0) 285.6(1.5)	0.0
OTHER	358	41,342(4%)	100.0(0.0) 317.1(6.4)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	1097	99,782(5%)	100.0(0.0) 284.5(1.3)	0.0
GRADUATED H.S.	3263	323,606(3%)	100.0(0.0) 293.8(0.7)	0.0
SOME EDUC AFTER H.S.	2609	259,826(3%)	100.0(0.0) 306.6(0.8)	0.0
GRADUATED COLLEGE	4415	463,731(4%)	100.0(0.0) 316.0(0.9)	0.0
UNKNOWN	400	36,894(6%)	100.0(0.0) 278.8(1.2)	0.0

Table 15.102

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 11

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	11850	1,190,734(1%)	50.4(0.9) 306.1(1.0)	49.6(0.9) 301.8(0.8)	0.0
SEX					
MALE	5840	599,642(2%)	100.0(0.0) 306.1(1.0)	0.0(0.0) *****(0.0)	0.0
FEMALE	6010	591,093(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 301.8(0.8)	0.0
ETHNICITY/RACE					
WHITE	8389	904,251(1%)	50.1(1.0) 311.1(0.9)	49.9(1.0) 307.8(0.7)	0.0
BLACK	1918	156,313(2%)	49.1(1.8) 281.2(1.9)	50.9(1.8) 277.2(1.2)	0.0
HISPANIC	1185	88,829(3%)	51.1(2.0) 288.6(2.0)	48.9(2.0) 282.5(1.6)	0.0
OTHER	358	41,342(4%)	58.2(2.8) 323.2(7.5)	41.8(2.8) 308.5(5.3)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	1097	99,782(5%)	45.5(2.2) 287.9(2.1)	54.5(2.2) 281.6(1.3)	0.0
GRADUATED H.S.	3263	323,606(3%)	49.9(1.5) 294.9(1.0)	50.1(1.5) 292.8(0.8)	0.0
SOME EDUC AFTER H.S.	2609	259,826(3%)	47.1(1.2) 309.3(1.0)	52.9(1.2) 304.2(1.1)	0.0
GRADUATED COLLEGE	4415	463,731(4%)	52.3(1.3) 318.0(1.3)	47.7(1.3) 313.8(1.0)	0.0
UNKNOWN	400	36,894(6%)	62.5(2.5) 282.2(2.0)	37.5(2.5) 273.1(2.7)	0.0

Table 15.103

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 11

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	11850	1,190,734(1%)	24.6(0.4)	20.8(1.3)	27.6(1.5)	27.1(0.5)	0.0
			309.6(1.5)	297.2(1.1)	305.6(1.2)	302.3(2.0)	
SEX							
MALE	5840	599,642(2%)	25.3(1.1)	20.0(1.2)	27.9(1.4)	26.8(0.9)	0.0
			312.5(1.9)	298.0(1.4)	306.5(1.6)	305.5(2.7)	
FEMALE	6010	591,093(2%)	23.9(1.2)	21.5(1.6)	27.2(1.7)	27.4(0.7)	0.0
			306.5(1.7)	296.4(1.3)	304.7(1.2)	299.1(1.4)	
ETHNICITY/RACE							
WHITE	8389	904,251(1%)	26.0(0.4)	19.5(1.6)	31.4(1.7)	23.1(0.4)	0.0
			314.1(1.5)	305.6(1.7)	309.1(1.2)	307.9(1.6)	
BLACK	1918	156,313(2%)	24.2(0.8)	39.6(0.7)	19.9(2.6)	16.3(2.8)	0.0
			283.9(2.6)	274.7(1.2)	281.1(4.1)	280.7(2.8)	
HISPANIC	1185	88,829(3%)	14.2(2.2)	7.5(1.5)	10.4(2.4)	67.9(1.4)	0.0
			290.0(4.1)	281.6(3.9)	282.6(2.7)	285.6(2.0)	
OTHER	358	41,342(4%)	17.8(5.3)	6.1(1.5)	9.4(2.8)	66.8(6.5)	0.0
			331.1(5.7)	307.1(5.5)	304.0(6.4)	316.1(8.9)	
PARENTAL EDUCATION							
LESS THAN H.S.	1097	99,782(5%)	20.4(2.2)	28.8(2.2)	20.3(2.1)	30.6(3.2)	0.0
			291.0(3.5)	279.8(2.6)	285.3(1.9)	284.1(1.8)	
GRADUATED H.S.	3263	323,606(3%)	23.0(1.6)	21.7(1.8)	32.7(2.2)	22.6(0.9)	0.0
			297.0(1.5)	290.4(1.9)	296.4(1.1)	290.4(1.2)	
SOME EDUC AFTER H.S.	2609	259,826(3%)	22.8(1.4)	19.3(1.6)	30.4(1.9)	27.4(1.1)	0.0
			310.5(1.5)	300.9(1.3)	309.6(1.2)	304.1(1.8)	
GRADUATED COLLEGE	4415	463,731(4%)	27.7(1.9)	18.9(1.7)	24.8(2.1)	28.6(1.9)	0.0
			321.5(1.4)	309.0(1.3)	317.1(1.1)	314.5(2.6)	
UNKNOWN	400	36,894(6%)	24.3(3.1)	18.9(2.6)	21.3(3.0)	35.4(3.1)	0.0
			283.7(4.1)	272.2(3.5)	277.0(2.7)	280.1(2.3)	

Table 15.104

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 11

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	11850	1,190,734(1%)	75.9(0.3) 309.4(0.7)	13.1(0.2) 279.2(1.2)	7.5(0.2) 285.6(1.5)	2.4(0.3) 330.6(5.3)	1.0(0.3) 285.5(2.7)	0.0(0.0) 307.8(13.4)	0.0
SEX									
MALE	5840	599,642(2%)	75.6(0.6) 311.1(0.9)	12.8(0.5) 281.2(1.9)	7.6(0.3) 288.6(2.0)	2.9(0.4) 337.0(6.3)	1.1(0.4) 288.3(3.3)	0.0(0.0) *****(0.0)	0.0
FEMALE	6010	591,093(2%)	76.3(0.6) 307.8(0.7)	13.5(0.4) 277.2(1.2)	7.4(0.3) 282.5(1.6)	2.0(0.2) 321.0(4.7)	0.9(0.3) 282.0(3.6)	0.0(0.0) 307.8(13.4)	0.0
ETHNICITY/RACE									
WHITE	8389	904,251(1%)	100.0(0.0) 309.4(0.7)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
BLACK	1918	156,313(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 279.2(1.2)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
HISPANIC	1185	88,829(3%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 285.6(1.5)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
OTHER	358	41,342(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	69.9(8.4) 330.6(5.3)	29.7(8.4) 285.5(2.7)	0.5(0.3) 307.8(13.4)	0.0
PARENTAL EDUCATION									
LESS THAN H.S.	1097	99,782(5%)	59.9(2.4) 290.5(1.7)	17.3(1.5) 269.6(1.8)	19.2(2.1) 278.4(2.0)	1.4(0.5) 306.8(10.4)	2.1(0.8) 276.1(4.2)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	3263	323,606(3%)	75.8(0.8) 299.0(0.7)	14.3(0.5) 273.1(1.6)	7.5(0.6) 280.0(1.6)	1.2(0.3) 313.5(8.3)	1.2(0.3) 284.3(2.7)	0.0(0.0) 294.4(****)	0.0
SOME EDUC AFTER H.S.	2609	259,826(3%)	78.4(0.8) 312.0(0.8)	13.3(0.7) 281.2(2.0)	5.9(0.6) 293.1(2.4)	1.5(0.4) 309.9(7.2)	0.9(0.3) 296.4(5.1)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	4415	463,731(4%)	80.6(0.9) 319.5(0.7)	10.5(0.5) 289.0(2.0)	4.6(0.3) 297.8(2.7)	3.7(0.7) 343.4(5.0)	0.6(0.2) 295.6(7.1)	0.0(0.0) 311.3(17.8)	0.0
UNKNOWN	400	36,894(6%)	45.7(2.6) 283.3(1.9)	22.4(2.0) 268.5(3.5)	22.3(2.3) 272.9(2.3)	6.1(1.6) 312.6(8.4)	3.6(1.7) 264.8(6.5)	0.0(0.0) *****(0.0)	0.0

Table 15.105

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 11

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	11784	1,183,839(1%)	8.4(0.5)	27.3(0.8)	21.9(0.5)	39.2(1.3)	3.1(0.2)	0.6
			284.5(1.3)	293.8(0.7)	306.6(0.8)	316.0(0.9)	278.8(1.2)	
SEX								
MALE	5795	594,942(2%)	7.6(0.6)	27.2(1.1)	20.6(0.6)	40.7(1.7)	3.9(0.3)	0.8
			287.9(2.1)	294.9(1.0)	309.3(1.0)	318.0(1.3)	282.2(2.0)	
FEMALE	5989	588,897(2%)	9.2(0.5)	27.5(1.0)	23.3(0.7)	37.6(1.3)	2.4(0.2)	0.4
			281.6(1.3)	292.8(0.8)	304.2(1.1)	313.8(1.0)	273.1(2.7)	
ETHNICITY/RACE								
WHITE	8348	899,287(1%)	6.6(0.5)	27.3(0.9)	22.7(0.6)	41.6(1.5)	1.9(0.2)	0.5
			290.5(1.7)	299.0(0.7)	312.0(0.8)	319.5(0.7)	283.3(1.9)	
BLACK	1905	155,249(2%)	11.1(0.8)	29.9(1.1)	22.2(1.2)	31.5(1.3)	5.3(0.5)	0.7
			269.6(1.8)	273.1(1.6)	281.2(2.0)	289.0(2.0)	268.5(3.5)	
HISPANIC	1174	88,011(3%)	21.8(2.7)	27.5(2.0)	17.4(1.7)	24.0(1.9)	9.3(1.0)	0.9
			278.4(2.0)	280.0(1.6)	293.1(2.4)	297.8(2.7)	272.9(2.3)	
OTHER	357	41,292(4%)	8.5(2.1)	19.0(2.3)	15.1(2.3)	48.7(6.4)	8.6(2.2)	0.1
			288.5(6.7)	299.0(5.8)	304.9(5.2)	336.9(6.0)	295.0(5.5)	
PARENTAL EDUCATION								
LESS THAN H.S.	1097	99,782(5%)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			284.5(1.3)	*****(0.0)	*****(0.0)	*****(0.0)	*****(0.0)	
GRADUATED H.S.	3263	323,606(3%)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	293.8(0.7)	*****(0.0)	*****(0.0)	*****(0.0)	
SOME EDUC AFTER H.S.	2609	259,826(3%)	0.0(0.0)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	*****(0.0)	306.6(0.8)	*****(0.0)	*****(0.0)	
GRADUATED COLLEGE	4415	463,731(4%)	0.0(0.0)	0.0(0.0)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	*****(0.0)	*****(0.0)	316.0(0.9)	*****(0.0)	
UNKNOWN	400	36,894(6%)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	100.0(0.0)	0.0
			*****(0.0)	*****(0.0)	*****(0.0)	*****(0.0)	278.8(1.2)	

Table 15.106

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 11

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	11794	1,184,777(1%)	13.9(0.4) 286.2(1.3)	24.6(0.5) 300.0(0.8)	61.5(0.8) 309.7(0.8)	0.5
SEX						
MALE	5802	595,683(2%)	14.5(0.6) 288.2(1.8)	24.7(0.7) 301.6(1.1)	60.8(0.9) 312.4(0.9)	0.7
FEMALE	5992	589,095(2%)	13.3(0.5) 284.0(1.4)	24.5(0.7) 298.4(1.0)	62.2(0.9) 307.1(0.9)	0.3
ETHNICITY/RACE						
WHITE	8354	900,157(1%)	10.1(0.5) 293.0(1.4)	23.0(0.7) 306.1(0.8)	66.9(0.9) 313.2(0.7)	0.5
BLACK	1907	155,229(2%)	21.1(1.2) 268.8(1.6)	30.4(1.1) 277.5(1.5)	48.4(1.4) 284.9(1.4)	0.7
HISPANIC	1176	88,099(3%)	32.3(2.0) 275.5(1.8)	30.1(1.6) 287.1(1.6)	37.6(2.7) 293.0(2.1)	0.8
OTHER	357	41,292(4%)	30.2(3.2) 306.7(8.2)	26.0(2.1) 313.5(6.1)	43.9(3.9) 326.5(5.6)	0.1
PARENTAL EDUCATION						
LESS THAN H.S.	1095	99,592(5%)	33.8(1.6) 278.9(2.3)	32.0(1.6) 285.7(2.2)	34.2(2.0) 289.1(1.4)	0.2
GRADUATED H.S.	3259	323,266(3%)	18.0(0.9) 282.9(1.8)	28.7(1.0) 291.9(1.1)	53.4(1.2) 298.6(0.9)	0.1
SOME EDUC AFTER H.S.	2607	259,576(3%)	10.0(0.7) 291.3(1.6)	25.5(0.9) 305.1(1.2)	64.5(1.1) 309.6(1.0)	0.1
GRADUATED COLLEGE	4411	463,225(4%)	7.0(0.5) 301.7(2.7)	19.6(0.6) 311.7(1.3)	73.4(0.8) 318.5(0.9)	0.1
UNKNOWN	400	36,894(6%)	37.8(3.0) 272.2(2.5)	27.2(2.3) 281.6(3.5)	35.0(2.8) 283.8(2.9)	0.0

BEST COPY AVAILABLE

Table 15.107

Weighted Response Percentages and General Mathematics Proficiency Means, Grade 11

by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	11814	1,186,881(1%)	46.1(0.9) 312.5(0.9)	44.6(0.8) 299.6(0.8)	9.3(0.5) 283.3(1.1)	0.3
SEX						
MALE	5814	596,987(2%)	45.9(1.2) 313.9(1.1)	44.3(1.0) 302.6(1.1)	9.7(0.6) 286.4(1.5)	0.4
FEMALE	6000	589,894(2%)	46.3(1.1) 311.2(1.0)	44.8(1.0) 296.6(0.8)	8.9(0.5) 279.8(1.7)	0.2
ETHNICITY/RACE						
WHITE	8362	900,973(1%)	50.8(1.1) 315.8(0.9)	42.8(0.9) 304.9(0.7)	6.4(0.5) 291.1(1.5)	0.4
BLACK	1913	155,973(2%)	22.4(1.0) 287.1(2.4)	53.8(1.3) 279.6(1.4)	23.8(1.4) 270.8(2.0)	0.2
HISPANIC	1181	88,594(3%)	41.8(1.7) 291.4(2.4)	46.2(1.8) 284.2(1.6)	12.0(1.2) 271.8(2.8)	0.3
OTHER	358	41,342(4%)	43.2(2.4) 322.7(6.2)	45.1(3.1) 313.5(7.8)	11.7(1.9) 310.1(6.9)	0.0
PARENTAL EDUCATION						
LESS THAN H.S.	1096	99,679(5%)	36.0(1.8) 291.8(1.7)	49.9(1.6) 283.0(1.5)	14.1(1.5) 271.2(3.2)	0.1
GRADUATED H.S.	3259	323,331(3%)	37.6(1.1) 300.4(0.9)	50.4(1.1) 292.7(1.0)	12.0(1.0) 278.1(1.4)	0.1
SOME EDUC AFTER H.S.	2607	259,718(3%)	44.6(1.5) 313.3(1.2)	46.7(1.4) 303.5(0.9)	8.7(0.6) 288.7(2.2)	0.0
GRADUATED COLLEGE	4412	463,510(4%)	56.3(1.2) 322.1(0.9)	37.8(1.2) 310.2(1.2)	5.9(0.5) 295.8(2.5)	0.0
UNKNOWN	399	36,852(6%)	31.2(2.6) 282.2(3.0)	49.9(2.4) 280.0(2.3)	19.0(2.5) 270.0(3.0)	0.1

Table 15.108

Weighted Response Percentages and General Science Proficiency Means, Grade 11

Total Sample

	N	WEIGHTED N	TOTAL	MISSING
-- TOTAL --	11744	1,174,394(1%)	100.0(0.0) 291.0(1.0)	0.0
SEX				
MALE	5755	581,793(2%)	100.0(0.0) 298.7(1.1)	0.0
FEMALE	5989	592,601(2%)	100.0(0.0) 283.5(1.0)	0.0
ETHNICITY/RACE				
WHITE	8291	892,376(1%)	100.0(0.0) 300.1(1.0)	0.0
BLACK	1933	156,663(2%)	100.0(0.0) 253.1(1.5)	0.0
HISPANIC	1159	85,196(3%)	100.0(0.0) 263.8(1.5)	0.0
OTHER	361	40,159(4%)	100.0(0.0) 294.6(8.4)	0.0
PARENTAL EDUCATION				
LESS THAN H.S.	1121	103,587(5%)	100.0(0.0) 264.1(1.6)	0.0
GRADUATED H.S.	3297	325,830(3%)	100.0(0.0) 277.4(1.0)	0.0
SOME EDUC AFTER H.S.	2539	250,395(2%)	100.0(0.0) 295.2(1.0)	0.0
GRADUATED COLLEGE	4323	450,721(4%)	100.0(0.0) 307.8(1.2)	0.0
UNKNOWN	422	39,302(8%)	100.0(0.0) 258.8(2.9)	0.0

Table 15.109

Weighted Response Percentages and General Science Proficiency Means, Grade 11

by Sex of Subject

	N	WEIGHTED N	MALE	FEMALE	MISSING
-- TOTAL --	11744	1,174,394(1%)	49.5(0.8) 298.7(1.1)	50.5(0.8) 283.5(1.0)	0.0
SEX					
MALE	5755	581,793(2%)	100.0(0.0) 298.7(1.1)	0.0(0.0) *****(0.0)	0.0
FEMALE	5989	592,601(2%)	0.0(0.0) *****(0.0)	100.0(0.0) 283.5(1.0)	0.0
ETHNICITY/RACE					
WHITE	8291	892,376(1%)	49.7(0.9) 307.8(1.1)	50.3(0.9) 292.6(1.0)	0.0
BLACK	1933	156,663(2%)	47.4(1.4) 259.3(1.7)	52.6(1.4) 247.4(1.6)	0.0
HISPANIC	1159	85,196(3%)	48.7(1.5) 266.1(2.1)	51.3(1.5) 261.6(2.0)	0.0
OTHER	361	40,159(4%)	55.5(3.6) 309.6(9.5)	44.5(3.6) 275.8(6.5)	0.0
PARENTAL EDUCATION					
LESS THAN H.S.	1121	103,587(5%)	42.4(1.7) 273.4(2.1)	57.6(1.7) 257.3(2.0)	0.0
GRADUATED H.S.	3297	325,830(3%)	49.3(1.1) 283.8(1.4)	50.7(1.1) 271.2(1.1)	0.0
SOME EDUC AFTER H.S.	2539	250,395(2%)	46.8(1.1) 303.4(1.5)	53.2(1.1) 287.9(1.4)	0.0
GRADUATED COLLEGE	4323	450,721(4%)	51.8(1.0) 315.1(1.4)	48.2(1.0) 299.9(1.2)	0.0
UNKNOWN	422	39,302(8%)	60.9(3.1) 265.8(3.1)	39.1(3.1) 247.9(4.4)	0.0

Table 15.110

Weighted Response Percentages and General Science Proficiency Means, Grade 11

by Region of Country

	N	WEIGHTED N	N-EAST	S-EAST	CENTRAL	WEST	MISSING
-- TOTAL --	11744	1,174,394(1%)	24.2(0.4) 297.4(2.2)	20.8(1.3) 282.2(1.3)	28.1(1.5) 293.5(1.6)	26.9(0.5) 289.5(2.5)	0.0
SEX							
MALE	5755	581,793(2%)	24.5(1.1) 307.1(2.3)	19.9(1.4) 288.7(1.9)	28.7(1.5) 299.6(2.0)	27.0(0.9) 297.6(2.5)	0.0
FEMALE	5989	592,601(2%)	23.9(1.2) 287.7(2.4)	21.6(1.3) 276.3(1.4)	27.6(1.7) 287.4(1.5)	26.9(0.7) 281.6(2.3)	0.0
ETHNICITY/RACE							
WHITE	8291	892,376(1%)	25.4(0.4) 305.0(2.3)	19.3(1.6) 295.6(2.0)	32.1(1.7) 299.0(1.5)	23.3(0.3) 300.3(2.0)	0.0
BLACK	1933	156,663(2%)	24.1(0.8) 257.1(4.5)	41.3(1.2) 248.2(1.2)	18.6(2.7) 253.3(3.0)	16.0(2.9) 259.2(5.3)	0.0
HISPANIC	1159	85,196(3%)	13.8(2.0) 268.1(6.2)	6.7(1.5) 260.3(5.8)	11.7(2.8) 258.8(3.8)	67.7(1.5) 264.2(1.8)	0.0
OTHER	361	40,159(4%)	20.7(5.8) 317.3(9.2)	4.7(1.4) 288.5(8.6)	10.3(2.7) 283.8(6.5)	64.3(7.0) 289.4(11.5)	0.0
PARENTAL EDUCATION							
LESS THAN H.S.	1121	103,587(5%)	19.8(2.1) 273.1(4.9)	30.4(2.4) 257.7(3.1)	20.9(2.5) 267.8(3.2)	28.9(2.8) 262.1(1.7)	0.0
GRADUATED H.S.	3297	325,830(3%)	24.2(1.3) 280.9(3.0)	22.7(2.1) 271.5(2.1)	31.7(2.3) 281.3(1.3)	21.5(1.5) 274.0(1.4)	0.0
SOME EDUC AFTER H.S.	2539	250,395(2%)	21.5(1.2) 299.8(2.1)	19.5(1.6) 290.3(2.3)	30.6(2.0) 297.8(1.9)	28.5(0.7) 292.1(2.4)	0.0
GRADUATED COLLEGE	4323	450,721(4%)	26.6(1.9) 314.0(2.4)	17.9(1.6) 299.9(1.5)	26.8(2.0) 307.9(2.0)	28.7(1.9) 306.7(2.7)	0.0
UNKNOWN	422	39,302(8%)	25.8(3.7) 267.8(3.0)	17.8(2.9) 247.5(6.0)	19.7(3.1) 261.0(6.3)	36.8(3.7) 256.7(6.0)	0.0

Table 15.111

Weighted Response Percentages and General Science Proficiency Means, Grade 11

by Derived Race

	N	WEIGHTED N	WHITE	BLACK	HISPANIC	ASIAN AMER	AMER IND	UNCLASS	MISSING
-- TOTAL --	11744	1,174,394(1%)	76.0(0.4)	13.3(0.3)	7.3(0.2)	2.3(0.3)	1.0(0.4)	0.0(0.0)	0.0
			300.1(1.0)	253.1(1.5)	263.8(1.5)	307.0(7.2)	267.4(6.6)	270.9(13.7)	
SEX									
MALE	5755	581,793(2%)	76.3(0.5)	12.8(0.4)	7.1(0.3)	2.7(0.4)	1.0(0.3)	0.1(0.1)	0.0
			307.8(1.1)	259.3(1.7)	266.1(2.1)	323.0(8.1)	276.4(7.7)	269.1(15.9)	
FEMALE	5989	592,601(2%)	75.7(0.6)	13.9(0.4)	7.4(0.3)	1.9(0.3)	1.1(0.4)	0.0(0.0)	0.0
			292.6(1.0)	247.4(1.6)	261.6(2.0)	284.9(5.9)	258.9(6.2)	290.8(****)	
ETHNICITY/RACE									
WHITE	8291	892,376(1%)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			300.1(1.0)	*****(0.0)	*****(0.0)	*****(0.0)	*****(0.0)	*****(0.0)	
BLACK	1933	156,663(2%)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	253.1(1.5)	*****(0.0)	*****(0.0)	*****(0.0)	*****(0.0)	
HISPANIC	1159	85,196(3%)	0.0(0.0)	0.0(0.0)	100.0(0.0)	0.0(0.0)	0.0(0.0)	0.0(0.0)	0.0
			*****(0.0)	*****(0.0)	263.8(1.5)	*****(0.0)	*****(0.0)	*****(0.0)	
OTHER	361	40,159(4%)	0.0(0.0)	0.0(0.0)	0.0(0.0)	68.5(8.9)	30.3(9.5)	1.2(0.8)	0.0
			*****(0.0)	*****(0.0)	*****(0.0)	307.0(7.2)	267.4(6.6)	270.9(13.7)	
PARENTAL EDUCATION									
LESS THAN H.S.	1121	103,587(5%)	57.0(2.3)	18.4(1.6)	19.5(2.1)	1.6(0.4)	3.4(1.8)	0.0(0.0)	0.0
			275.2(2.7)	239.9(2.4)	253.7(2.0)	289.9(7.1)	256.8(3.9)	*****(0.0)	
GRADUATED H.S.	3297	325,830(3%)	76.3(0.8)	14.5(0.7)	7.2(0.5)	1.1(0.2)	0.9(0.2)	0.0(0.0)	0.0
			286.2(1.1)	243.0(1.4)	254.8(1.9)	278.6(7.6)	263.9(8.7)	*****(0.0)	
SOME EDUC AFTER H.S.	2539	250,395(2%)	79.3(0.9)	12.4(0.8)	5.8(0.5)	1.5(0.4)	0.9(0.3)	0.0(0.0)	0.0
			302.1(1.1)	258.7(2.3)	281.6(2.5)	291.2(11.7)	285.5(6.0)	*****(0.0)	
GRADUATED COLLEGE	4323	450,721(4%)	81.0(0.9)	10.9(0.5)	3.9(0.3)	3.6(0.6)	0.4(0.1)	0.1(0.1)	0.0
			313.9(0.9)	267.2(2.9)	281.1(2.9)	325.8(6.8)	290.2(6.4)	270.9(13.7)	
UNKNOWN	422	39,302(8%)	44.8(3.0)	24.9(2.1)	22.0(1.9)	4.6(1.1)	3.7(2.1)	0.0(0.0)	0.0
			279.1(2.8)	238.5(3.6)	246.5(4.1)	245.4(6.8)	239.5(11.2)	*****(0.0)	

Table 15.112

Weighted Response Percentages and General Science Proficiency Means, Grade 11

by Level of Parents' Education

	N	WEIGHTED N	NOT HS	GRAD HS	POST HS	GRAD COL	UNKNOWN	MISSING
-- TOTAL --	11702	1,169,834(1%)	8.9(0.4) 264.1(1.6)	27.9(0.9) 277.4(1.0)	21.4(0.5) 295.2(1.0)	38.5(1.3) 307.8(1.2)	3.4(0.2) 258.8(2.9)	0.4
SEX								
MALE	5731	578,995(2%)	7.6(0.4) 273.4(2.1)	27.8(1.0) 283.8(1.4)	20.2(0.6) 303.4(1.5)	40.3(1.4) 315.1(1.4)	4.1(0.3) 265.8(3.1)	0.5
FEMALE	5971	590,840(2%)	10.1(0.6) 257.3(2.0)	27.9(0.9) 271.2(1.1)	22.6(0.7) 287.9(1.4)	36.8(1.4) 299.9(1.2)	2.6(0.3) 247.9(4.4)	0.3
ETHNICITY/RACE								
WHITE	8261	888,762(1%)	6.6(0.4) 275.2(2.7)	28.0(1.1) 286.2(1.1)	22.3(0.6) 302.1(1.1)	41.1(1.5) 313.9(0.9)	2.0(0.2) 279.1(2.8)	0.4
BLACK	1928	156,342(2%)	12.2(0.9) 239.9(2.4)	30.1(1.2) 243.0(1.4)	19.9(1.2) 258.7(2.3)	31.5(1.3) 267.2(2.9)	6.3(0.7) 238.5(3.6)	0.2
HISPANIC	1153	84,665(3%)	23.9(2.7) 253.7(2.0)	27.8(2.0) 254.8(1.9)	17.2(1.3) 281.6(2.5)	20.8(1.6) 281.1(2.9)	10.2(1.0) 246.5(4.1)	0.6
OTHER	360	40,066(4%)	13.1(4.2) 267.4(6.8)	16.2(2.1) 272.1(6.9)	15.4(2.5) 289.0(8.5)	47.2(7.2) 320.7(6.7)	8.1(2.0) 242.8(7.5)	0.2
PARENTAL EDUCATION								
LESS THAN H.S.	1121	103,587(5%)	100.0(0.0) 264.1(1.6)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED H.S.	3297	325,830(3%)	0.0(0.0) *****(0.0)	100.0(0.0) 277.4(1.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
SOME EDUC AFTER H.S.	2539	250,395(2%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 295.2(1.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0
GRADUATED COLLEGE	4323	450,721(4%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 307.8(1.2)	0.0(0.0) *****(0.0)	0.0
UNKNOWN	422	39,302(8%)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	0.0(0.0) *****(0.0)	100.0(0.0) 258.8(2.9)	0.0

Table 15.113

Weighted Response Percentages and General Science Proficiency Means, Grade 11

by Articles in the Home

	N	WEIGHTED N	0-3	4	5	MISSING
-- TOTAL --	11707	1,170,453(1%)	14.0(0.5) 264.5(1.2)	24.9(0.5) 286.0(1.2)	61.1(0.7) 299.3(1.0)	0.3
SEX						
MALE	5735	579,484(2%)	14.3(0.7) 271.3(1.6)	25.5(0.7) 293.3(1.5)	60.2(0.9) 307.8(1.1)	0.4
FEMALE	5972	590,969(2%)	13.7(0.6) 257.5(1.6)	24.2(0.8) 278.4(1.5)	62.1(0.8) 291.3(1.1)	0.3
ETHNICITY/RACE						
WHITE	8266	889,421(1%)	10.5(0.5) 279.0(1.6)	23.4(0.6) 295.7(1.1)	66.1(0.8) 305.2(1.0)	0.3
BLACK	1928	156,358(2%)	21.7(1.4) 237.0(1.9)	30.2(1.7) 252.6(1.9)	48.1(1.3) 260.8(2.0)	0.2
HISPANIC	1152	84,515(3%)	31.1(2.6) 247.9(2.3)	30.1(1.4) 265.2(2.6)	38.8(2.3) 275.3(1.7)	0.8
OTHER	361	40,159(4%)	26.7(4.3) 266.5(7.0)	25.5(2.7) 292.4(8.3)	47.8(5.1) 311.4(7.2)	0.0
PARENTAL EDUCATION						
LESS THAN H.S.	1118	103,212(5%)	33.2(1.3) 253.1(2.2)	31.1(1.8) 264.9(2.4)	35.7(1.5) 273.9(2.7)	0.4
GRADUATED H.S.	3294	325,603(3%)	17.7(0.9) 260.0(1.9)	28.2(1.2) 275.9(1.6)	54.0(1.5) 284.0(1.3)	0.1
SOME EDUC AFTER H.S.	2539	250,395(2%)	10.1(0.6) 272.7(2.3)	25.8(1.0) 292.8(1.9)	64.1(1.2) 299.6(1.1)	0.0
GRADUATED COLLEGE	4322	450,606(4%)	7.0(0.5) 286.0(2.7)	20.2(0.7) 302.1(1.7)	72.8(0.8) 311.4(1.2)	0.0
UNKNOWN	422	39,302(8%)	37.0(2.7) 248.7(4.0)	29.1(2.0) 258.7(4.0)	34.0(2.5) 269.9(3.5)	0.0

Table 15.114

Weighted Response Percentages and General Science Proficiency Means, Grade 11 by Television Viewing Each Day

	N	WEIGHTED N	0-2	3-5	6+	MISSING
-- TOTAL --	11707	1,170,740(1%)	46.3(1.1) 302.8(1.2)	44.2(1.0) 284.5(0.8)	9.5(0.4) 264.6(1.7)	0.3
SEX						
MALE	5732	579,377(2%)	46.4(1.4) 310.2(1.4)	43.8(1.2) 292.3(1.0)	9.8(0.6) 274.2(1.8)	0.4
FEMALE	5975	591,363(2%)	46.1(1.0) 295.6(1.3)	44.7(1.0) 277.0(1.1)	9.1(0.5) 254.5(2.3)	0.2
ETHNICITY/RACE						
WHITE	8264	889,363(1%)	50.8(1.1) 308.2(1.2)	42.5(1.0) 293.9(0.8)	6.7(0.4) 280.1(2.0)	0.3
BLACK	1929	156,505(2%)	23.8(1.7) 263.4(3.1)	52.2(1.6) 253.0(1.6)	24.0(1.5) 243.0(1.4)	0.1
HISPANIC	1155	84,862(3%)	38.3(1.9) 270.9(2.2)	49.3(1.9) 262.5(1.7)	12.4(1.2) 248.0(3.2)	0.4
OTHER	359	40,010(4%)	51.7(4.6) 306.9(8.7)	41.4(4.7) 281.3(7.5)	6.8(1.6) 285.8(9.6)	0.4
PARENTAL EDUCATION						
LESS THAN H.S.	1119	103,306(5%)	35.2(1.8) 271.9(2.2)	49.8(1.6) 262.2(2.6)	15.0(1.2) 252.2(4.1)	0.3
GRADUATED H.S.	3290	325,491(3%)	38.2(1.3) 287.0(1.5)	50.1(1.4) 275.2(1.1)	11.6(0.7) 256.0(2.1)	0.1
SOME EDUC AFTER H.S.	2536	250,207(2%)	45.6(1.3) 302.6(1.4)	45.5(1.1) 291.4(1.1)	8.9(0.6) 276.2(2.5)	0.1
GRADUATED COLLEGE	4321	450,518(4%)	56.4(1.3) 316.9(1.3)	37.7(1.3) 298.3(1.3)	5.9(0.4) 280.5(2.7)	0.0
UNKNOWN	421	39,260(7%)	30.7(2.2) 266.5(3.4)	48.6(2.6) 259.8(4.4)	20.7(2.2) 244.8(4.1)	0.1

APPENDIX A

Instrument and Item Tables

Table A.1

Subject Area Blocks in Booklets, Grade 3/Age 9

BOOKLET	BLOCKS		
*1)	9R1	9M1	9S1
*2)	9S2	9R2	9M3
*3)	9M2	9S3	9R3
**4)	9M1	9M2	9S3
**5)	9S1	9S2	9M3
6)	9S3	9S4	9S1
7)	9R5	9R1	9C2
8)	9S3	9S7	9S5
9)	9C2	9M6	9S3
10)	9R3	9R2	9C1
11)	9M4	9M1	9M2
12)	9R1	9M4	9S4
13)	9R4	9C1	9M3
14)	9S2	9R6	9M7
15)	9M1	9C2	9R6
16)	9M2	9R6	9S1
17)	9S6	9M5	9R1
18)	9S6	9S3	9S2
19)	9M1	9M6	9M3
20)	9S1	9C2	9M3
21)	9M5	9S4	9R3
22)	9M2	9M5	9M3
23)	9R3	9S5	9M3
24)	9R4	9S3	9M1
25)	9R4	9S5	9M6
26)	9R6	9R3	9R1
27)	9S1	9S5	9S6
28)	9M6	9M2	9M7
29)	9M4	9M6	9M5
30)	9S4	9C3	9M2
31)	9S7	9C3	9M5
32)	9R5	9M2	9S7
33)	9C2	9C1	9C3
34)	9S5	9M7	9C1
35)	9R2	9R5	9R6
36)	9M5	9M7	9M1
37)	9C1	9R1	9S3
38)	9M6	9S6	9R2
39)	9S2	9R3	9M4
40)	9S5	9S2	9S4
41)	9S7	9S1	9S2
42)	9S4	9S6	9S7
43)	9R2	9S7	9C2
44)	9C3	9S2	9R5
45)	9M7	9C3	9R2
46)	9M7	9M4	9M3
47)	9M1	9S1	9R5
48)	9R1	9R2	9R4
49)	9R6	9R4	9C3
50)	9C1	9M4	9S6
51)	9R5	9R4	9R3

* Booklet used for Bridge A assessment only
** Booklet used for Bridge B assessment only

Table A.2

Subject Area Blocks in Booklets, Grade 7/Age 13

BOOKLET	BLOCKS			BOOKLET	BLOCKS		
*1)	13R1	13M1	13S1	35)	13R4	13S7	13M3
*2)	13S2	13R2	13M3	36)	13C6	13R3	13R2
*3)	13M2	13S3	13R3	37)	13S3	13M2	13S8
**4)	13M1	13M2	13S3	38)	13M5	13M6	13M9
**5)	13S1	13S2	13M3	39)	13S5	13M4	13R3
6)	13R3	13R1	13R5	40)	13C5	13S1	13M4
7)	13M7	13M9	13M3	41)	13S7	13S6	13S8
8)	13S8	13M5	13R1	42)	13R2	13M2	13S4
9)	13C1	13C5	13C4	43)	13M2	13M8	13M9
10)	13M4	13M2	13M5	44)	13M4	13M1	13M9
11)	13S8	13S2	13S4	45)	13C2	13C1	13R6
12)	13S8	13C2	13R4	46)	13S5	13M6	13C4
13)	13M2	13M1	13M3	47)	13R5	13S9	13M6
14)	13R6	13R5	13C5	48)	13C4	13S6	13M9
15)	13S3	13S5	13S7	49)	13S6	13S9	13S1
16)	13R3	13C2	13S6	50)	13C4	13R6	13M2
17)	13M7	13R3	13C5	51)	13C1	13R2	13M9
18)	13C5	13C3	13R2	52)	13S6	13S3	13S2
19)	13R4	13C4	13C6	53)	13C2	13S3	13M7
20)	13R6	13R4	13R3	54)	13S7	13S2	13S9
21)	13S9	13S4	13S3	55)	13S4	13C6	13M5
22)	13C3	13M8	13S9	56)	13M6	13M7	13M2
23)	13C6	13C5	13C2	57)	13M1	13R6	13S1
24)	13R4	13C1	13R1	58)	13S9	13S8	13S5
25)	13M5	13M8	13M3	59)	13M1	13M5	13M7
26)	13M1	13R1	13C3	60)	13R5	13S7	13C1
27)	13C3	13C4	13C2	61)	13S1	13S8	13S3
28)	13M7	13M4	13M8	62)	13S2	13S1	13S5
29)	13M6	13M8	13M1	63)	13S2	13C3	13M3
30)	13M8	13R5	13S2	64)	13C1	13C6	13C3
31)	13S4	13S5	13S6	65)	13S7	13M7	13M9
32)	13R1	13R2	13R6	66)	13S1	13S4	13S7
33)	13M4	13M6	13M3	67)	13R1	13S3	13C6
34)	13R2	13R4	13R5				

* Booklet used for Bridge A assessment only
** Booklet used for Bridge B assessment only

Table A.3
Subject Area Blocks in Booklets, Grade 11/Age 17

BOOKLET	BLOCKS			BOOKLET	BLOCKS		
1)	Not Used			49)	17C3	17S2	17S11
2)	Not Used			50)	13R1	13R3	17C5
3)	Not Used			51)	17S7	17S8	13R6
*4)	17M1	17M2	17S3	52)	17C3	17S9	17S7
*5)	17S1	17S2	17M3	53)	13M5	13M4	17C2
6)	17S4	17M11	17M8	54)	17C4	17C6	13R1
7)	13R6	13R4	17C1	55)	17S7	17S11	17S4
8)	17S3	13S5	17S2	56)	13S5	17S10	17S4
9)	13R4	13M5	17M7	57)	17M1	17S2	17M10
10)	17M8	17M1	17C4	58)	17M7	17S8	17S9
11)	13M5	17M10	17M8	59)	17M2	17M8	17M9
12)	17S9	17M2	13S6	60)	17M8	17S11	17M3
13)	17M11	13R3	17M10	61)	13R1	13R5	13R4
14)	13R2	13M4	17M2	62)	17S2	17S4	13R5
15)	17M2	17S7	13M4	63)	17S4	17S8	17S3
16)	13S6	17S4	17M6	64)	17M10	13M4	17M1
17)	17S8	13S5	17C6	65)	13S6	17C1	17M9
18)	17S10	17S9	17S2	66)	17C4	17C1	17C5
19)	17S1	17S10	17C2	67)	17S8	17M10	17M3
20)	17M2	17M6	17M10	68)	17S3	13R6	17M3
21)	17C6	13R2	17C1	69)	17S11	17S10	17S8
22)	17C5	17C3	13R6	70)	17S3	17S11	17S9
23)	17S9	13S6	17S8	71)	17S9	17S4	17S1
24)	17M6	13R5	17C3	72)	17M8	17M7	17M6
25)	17M6	13M4	17M9	73)	13M4	17M7	17M3
26)	13R5	13R2	17C4	74)	13S5	13M5	17S10
27)	17C2	17C6	17C3	75)	17C6	17C5	13R5
28)	13R2	17C5	17S4	76)	17M11	17M2	13M5
29)	17M7	17M10	17M9	77)	17C1	17C2	13R5
30)	17M7	17M2	17C1	78)	17M11	17S1	17S10
31)	17M1	17M2	17M3	79)	13R4	17C6	17S1
32)	17M1	17M7	17M11	80)	17S2	13S6	17S7
33)	17C5	17C2	13R4	81)	13R3	13R4	13R2
34)	17M8	13R1	13S5	82)	13S6	17S3	17S1
35)	17C2	17C4	13R6	83)	17M10	17C6	17M3
36)	17M1	13R2	17M9	84)	17S1	17S7	13S5
37)	17S11	13M4	17M9	85)	13R5	13R6	13R3
38)	17C1	17C3	13R1	86)	13S5	17S9	13R3
39)	17S11	13S5	13S6	87)	13M4	17M8	17M11
40)	13M5	17M6	17M1	88)	17S10	13S6	13R4
41)	17M6	17M11	17M3	89)	13R6	13R1	13R2
42)	13R3	17C2	17M7	90)	17C4	17C3	13R3
43)	13M5	17M9	17M3	91)	17S2	17S1	17S8
44)	17M1	17S7	17S3	92)	13R4	17H1	17L1
45)	17S3	17C4	13M5	93)	17H2	13R4	17L2
46)	17C5	17M11	17M9	94)	17L3	13R4	17H3
47)	17S1	17S11	13R1	95)	17L4	17H4	13R4
48)	17S7	17S3	17S10				

*Booklet used for Bridge B assessment only

Table A.4

Block-to-Block Occurrence Matrix, Grade 3/Age 9
Spiral Booklets

	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6	M7	S1	S2	S3	S4	S5	S6	S7	C1	C2	C3
R1	6	1	1	1	1	1				1	1					1	1		1		1	1	
R2		6	1	1	1	1						1	1						1	1	1	1	1
R3			6	1	1	1			1	1	1				1		1	1			1		
R4				6	1	1	1		1			1				1		1			1		1
R5					6	1	1	1						1	1					1		1	1
R6						6	1	1					1	1	1							1	1
M1							6	1	1	1	1	1	1	1		1						1	
M2								6	1	1	1	1	1	1			1			1			1
M3									6	1	1	1	1	1				1			1	1	
M4										6	1	1	1		1		1		1		1		
M5											6	1	1				1		1	1			1
M6												6	1			1		1	1			1	
M7													6		1			1			1		1
S1														6	1	1	1	1	1	1		1	
S2															6	1	1	1	1	1			1
S3																6	1	1	1	1	1	1	
S4																	6	1	1	1			1
S5																		6	1	1	1		
S6																			6	1	1		
S7																				6		1	1
C1																					6	1	1
C2																						6	1
C3																							6

Table A.5

Block-to-Block Occurrence Matrix, Grade 7/Age 13
Spiral Booklets

	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6	M7	M8	M9	S1	S2	S3	S4	S5	S6	S7	S8	S9	C1	C2	C3	C4	C5	C6
R1	6	1	1	1	1	1	1				1							1					1		1		1			1
R2		6	1	1	1	1		1							1				1						1		1		1	1
R3			6	1	1	1				1			1							1	1					1			1	1
R4				6	1	1			1													1	1		1	1		1		1
R5					6	1						1		1			1					1		1	1				1	
R6						6	1	1								1									1	1		1	1	
M1							6	1	1	1	1	1	1	1	1	1											1			
M2								7	1	1	1	1	1	1	1			1	1				1					1		
M3									6	1	1	1	1	1	1		1					1					1			
M4										6	1	1	1	1	1	1				1									1	
M5											6	1	1	1	1				1				1							1
M6												6	1	1	1					1				1				1		
M7													7	1	2			1				1				1			1	
M8														6	1		1							1			1			
M9															7						1	1			1			1		
S1																6	1	1	1	1	1	1	1	1					1	
S2																	6	1	1	1	1	1	1	1			1			
S3																		7	1	1	1	1	2	1		1				1
S4																			6	1	1	1	1	1						1
S5																				6	1	1	1	1				1		
S6																					6	1	1	1		1		1		
S7																						7	1	1	1					
S8																							7	1		1				
S9																								6			1			
C1																									6	1	1	1	1	1
C2																										6	1	1	1	1
C3																											6	1	1	1
C4																												6	1	1
C5																													6	1
C6																														6

Table A.6

Block-to-Block Occurrence Matrix, Grade 11/Age 17
Spiral Booklets*

	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6	M7	M8	M9	M;	M:	S1	S2	S3	S4	S5	S6	S7	S8	S9	S;	S:	C1	C2	C3	C4	C5	C6
R1	7	1	1	1	1	1								1				1				1						1	1		1	1	1	1
R2		7	1	1	1	1	1	1		1					1						1								1			1	1	1
R3			7	1	1	1							1			1	1					1				1				1	1	1	1	
R4				7	1	1					1		1					1					1				1		1	1			1	1
R5					7	1						1							1		1								1	1	1	1	1	1
R6						7			1											1				1	1				1	1	1	1	1	
M1							8	1	1	1	1	1	1	1	1	2	1		1	1				1								1		
M2								8	1	2	1	1	1	1	1	1	1						1	1		1			1					
M3									8	1	1	1	1	1	1	2	1			1					1			1						1
M4										8	1	1	1	1	2	1	1							1				1		1				
M5											8	1	1	1	1	1	1			1		1					1			1		1		
M6												7	1	1	1	1	1				1		1								1			
M7													8	1	1	1	1								1	1			1	1				
M8														8	1	1	2				1	1						1				1		
M9															8	1	1						1					1	1				1	
M;																8	1		1						1									1
M:																	8	1			1						1						1	
S1																		8	1	1	1	1	1	1	1	1	2	1		1				1
S2																			7	1	1	1	1	1	1	1	1	1			1			
S3																				8	1	1	1	2	1	1	1	1				1		
S4																					8	1	1	1	1	1	1	1					1	
S5																						8	1	1	1	1	2	1						1
S6																							8	1	1	2	1	1	1					
S7																								8	1	1	1	1			1			
S8																									8	2	1	1						1
S9																										8	1	1			1			
S;																											8	1		1				
S:																												8			1			
C1																													7	1	1	1	1	1
C2																														7	1	1	1	1
C3																															7	1	1	1
C4																																7	1	1
C5																																	7	1
C6																																		7

*Semicolon (;) represents 10; colon (:) represents 11.

Table A.7

Composition of Items in Blocks, Grade 3/Age 9

Block	Type	Background Items	Cognitive Items	# Total Items	# Cognitive Items	# Open-Ended Cognitive Items
9R1	Rdg	1-11	12-21	21	10	
9R2	Rdg	1-9	10-20	20	11	
9R3	Rdg	1-7	8-17	17	10	1
9R4	Rdg	1-4	5-16	16	12	2
9R5	Rdg	1-10	11-24	24	14	
9R6	Rdg	1-4	5-17	17	13	
9S1	Sci	1-5	6-23	23	18	
9S2	Sci	---	1-25	25	25	
9S3	Sci	1-11	12-31	31	20	
9S4	Sci	1-9	10-23	23	14	
9S5	Sci	1-4	5-19	19	15	1
9S6	Sci	1-4	5-19	19	15	1
9S7	Sci	1-7	8-21	21	14	
9M1	Math	---	1-26	26	26	9
9M2	Math	---	1-26	26	26	9
9M3	Math	1-3	4-19 (5-14 calc.)	19	16	10
9M4	Math	1-7	8-28	28	21	7
9M5	Math	1-11	12-28	28	17	
9M6	Math	1-8	9-28	28	20	2
9M7	Math	1-10	11-28	28	18	
9C1	Comp	1-18,30,31	19-29,32-40	40	20	1
9C2	Comp	1-13,24,25	14-23,26-34	34	19	2
9C3	Comp	1-11,22,23	12-21,24-33	33	20	1

Table A.8

Composition of Items in Blocks, Grade 7/Age 13

Block	Type	Background Items	Cognitive Items	# Total Items	# Cognitive Items	# Open-Ended Cognitive Items
13R1	Rdg	1-19	20-31	31	12	1
13R2	Rdg	1-9	10-19	19	10	
13R3	Rdg	1-15	16-18 (19-28 SS)*	28	13	
13R4	Rdg	1-7	8-21	21	14	
13R5	Rdg	1-6	7-18	18	12	
13R6	Rdg	1-4	5-18	18	14	5
13S1	Sci	1-11	12-36	36	25	
13S2	Sci	1-9	10-40	40	31	
13S3	Sci	1-9	10-36	36	27	
13S4	Sci	1-9	10-27	27	18	1
13S5	Sci	1	2-19	19	18	
13S6	Sci	1-10	11-28	28	18	
13S7	Sci	1-9	10-27	27	18	1
13S8	Sci	1-14	15-32	32	18	1
13S9	Sci	1-13	14-31	31	18	
13M1	Math	1-14	15-51	51	37	9
13M2	Math	1-7	8-44	44	37	8
13M3	Math	1-8	8-32 (9-24 calc.)	32	24	10
13M4	Math	1-14	15-43	43	29	12
13M5	Math	1-17	18-43	43	26	15
13M6	Math	1-12	13-48	48	36	4
13M7	Math	1-16	17-55	55	39	8
13M8	Math	1-15	16-58	58	43	6
13M9	Math	1-16	17-57 (17-31 calc.)	57	41	14
13C1	Comp	1-19,31,32	20-30,33-42	42	21	1
13C2	Comp	1-13,25,26	14-24,27-35	35	20	2
13C3	Comp	16-19	1-15,20-28	28	24	
13C4	Comp	1-5,25,26	6-24,27-37	37	30	
13C5	Comp	1-6,10,11, 18,19	7-9,12-17	30	20	
13C6	Comp	1-10,21,22	11-20,23-33	33	21	1

*Study skills

Table A.9

Composition of Items in Blocks, Grade 11/Age 17

Block	Type	Background Items	Cognitive Items	# Total Items	# Cognitive Items	# Open-Ended Cognitive Items
13R1	Rdg	1-19	20-31	31	12	1
13R2	Rdg	1-9	10-19	19	10	
13R3	Rdg	1-15	16-18 (19-28 SS)*		13	
13R4	Rdg	1-7	8-21	21	14	
13R5	Rdg	1-6	7-18	18	12	
13R6	Rdg	1-4	5-18	18	14	5
17M1	Math	1-14	15-49	49	35	10
17M2	Math	1-14	15-49	49	35	5
17M3	Math	1-11	12-35 (12-30 calc.)	35	24	14
13M4	Math	1-14	15-43	43	29	12
13M5	Math	1-17	18-43	43	26	15
17M6	Math	1-10	11-46	46	36	18
17M7	Math	1-16	17-53	53	37	
17M8	Math	1-15	16-52	52	37	
17M9	Math	1-20	21-61 (21-33 calc.)	61	41	13
17M10	Math	1-10	11-46	46	36	
17M11	Math	1-11	12-48	48	37	3
17S1	Sci	1-11	12-38	38	27	
17S2	Sci	1-9	10-41	41	32	
17S3	Sci	1-9	10-32	32	23	
17S4	Sci	1-11	12-31	31	20	1
13S5	Sci	1	2-19	19	18	
13S6	Sci	1-10	11-28	28	18	
17S7	Sci	1-17	18-37	37	20	1
17S8	Sci	1-13	14-33	33	20	1
17S9	Sci	1-17	18-37	37	20	1
17S10	Sci	1-15	16-35	35	20	1
17S11	Sci	1-9	10-29	29	20	1
17C1	Comp	1-19,31,32	20-30,33-44	44	23	2
17C2	Comp	1-13,25,26	14-24,27-36	36	21	3
17C3	Comp	16-19	1-15,20-28	28	24	
17C4	Comp	1-21,31,32	22-30,33-40	40	17	
17C5	Comp	1-18,33,34	19-32,35-44	44	24	
17C6	Comp	1-17,26,27	18-25,28-36	36	17	1

*Study skills

Table A.9
(continued)

Block	Type	Background Items	Cognitive Items	# Total Items	# Cognitive Items	# Open-Ended Cognitive Items
17H1	Hist	1-12,49-61	13-48	61	36	
17H2	Hist	1-12,49-61	13-48	61	36	
17H3	Hist	1-12,48-60	13-47	60	35	
17H4	Hist	1-12,47-59	13-46	59	34	
17L1	Lit	1-18,49-72	19-48	72	30	
17L2	Lit	1-18,50-73	19-49	73	31	
17L3	Lit	1-18,49-72	19-48	72	30	
17L4	Lit	1-18,49-72	19-48	72	30	

Table A.10

Block Occurrence in Booklets, Grade 3/Age 9

	Occurs in Booklets	
Block	Bridge	BIB Spiral
9R1	1	7, 12, 17, 26, 37, 48
9R2	2	10, 35, 38, 43, 45, 48
9R3	3	10, 21, 23, 26, 39, 51, LM*
9R4		13, 24, 25, 48, 49, 51
9R5		7, 32, 35, 44, 47, 51
9R6		14, 15, 16, 26, 35, 49
9S1	1	5, 6, 16, 20, 27, 41, 47
9S2	2	5, 14, 18, 39, 40, 41, 44
9S3	3	4, 6, 8, 9, 18, 24, 37
9S4		6, 12, 21, 30, 40, 42
9S5		8, 23, 25, 27, 34, 40
9S6		17, 18, 27, 38, 42, 50
9S7		8, 31, 32, 41, 42, 43
9M1	1, 4	11, 15, 19, 24, 36, 47
9M2	3, 4	11, 16, 22, 28, 30, 32
9M3	2, 5	13, 19, 20, 22, 23, 46
9M4		11, 12, 29, 39, 46, 50, LM*
9M5		17, 21, 22, 29, 31, 36
9M6		9, 19, 25, 28, 29, 38
9M7		14, 28, 34, 36, 45, 46
9C1		10, 13, 33, 34, 37,50
9C2		7, 9, 15, 20, 33, 43
9C3		30, 31, 33, 44, 45, 49

*Language Minority Probe booklet

Table A.11

Block Occurrence in Booklets, Grade 7/Age 13

	Occurs in Booklets	
Block	**Bridge**	**BIB Spiral**
13R1	1	6, 8, 24, 26, 32, 67, LM*
13R2	2	18, 32, 34, 36, 42, 51
13R3	3	6, 16, 17, 20, 36, 39
13R4		12, 19, 20, 24, 34, 35
13R5		6, 14, 30, 34, 47, 60
13R6		14, 20, 32, 45, 50, 57
13S1	1, 5	40, 49, 57, 61, 62, 66
13S2	2, 5	11, 30, 52, 54, 62, 63
13S3	3, 4	15, 21, 37, 52, 53, 61, 67
13S4		11, 21, 31, 42, 55, 66
13S5		15, 31, 39, 46, 58, 62
13S6		16, 31, 41, 48, 49, 52
13S7		15, 35, 41, 54, 60, 65, 66
13S8		8, 11, 12, 37, 41, 58, 61
13S9		21, 22, 47, 49, 54, 58
13M1	1, 4	13, 26, 29, 44, 57, 59
13M2	3, 4	10, 13, 37, 42, 43, 50, 56
13M3	2, 5	7, 13, 25, 33, 35, 63
13M4		10, 28, 33, 39, 40, 44
13M5		8, 10, 25, 38, 55, 59
13M6		29, 33, 38, 46, 47, 56
13M7		7, 17, 28, 53, 56, 59, 65, LM*
13M8		22, 25, 28, 29, 30, 43
13M9		7, 38, 43, 44, 48, 51, 65
13C1		9, 24, 45, 51, 60, 64
13C2		12, 16, 23, 27, 45, 53
13C3		18, 22, 26, 27, 63, 64
13C4		9, 19, 27, 46, 48, 50
13C5		9, 14, 17, 18, 23, 40
13C6		19, 23, 36, 55, 64, 67

*Language Minority Probe booklet

Table A.12

Block Occurrence in Booklets, Grade 11/Age 17

Block	Occurs in Booklets	
	Bridge	BIB Spiral
13R1		34, 38, 47, 50, 54, 61, 89, LM*
13R2		14, 21, 26, 28, 36, 81, 89
13R3		13, 42, 50, 81, 85, 86, 90
13R4		7, 9, 33, 61, 79, 81, 88, 92, 93, 94, 95
13R5		24, 26, 61, 62, 75, 77, 85
13R6		7, 22, 35, 51, 68, 85, 89
17S1	5	19, 47, 71, 78, 79, 82, 84, 91
17S2	5	8, 18, 49, 57, 62, 80, 91
17S3	4	8, 44, 45, 48, 63, 68, 70, 82
17S4		6, 16, 28, 55, 56, 62, 63, 71
13S5		8, 17, 34, 39, 56, 74, 84, 86
13S6		12, 16, 23, 39, 65, 80, 82, 88
17S7		15, 44, 48, 51, 52, 55, 80, 84
17S8		17, 23, 51, 58, 63, 67, 69, 91
17S9		12, 18, 23, 52, 58, 70, 71, 86
17S10		18, 19, 48, 56, 69, 74, 78, 88
17S11		37, 39, 47, 49, 55, 60, 69, 70
17M1	4	10, 31, 32, 36, 40, 44, 57, 64
17M2	4	12, 14, 15, 20, 30, 31, 59, 76
17M3	5	31, 41, 43, 60, 67, 68, 73, 83
13M4		14, 15, 25, 37, 53, 64, 73, 87
13M5		9, 11, 40, 43, 45, 53, 74, 76
17M6		16, 20, 24, 25, 40, 41, 72
17M7		9, 29, 30, 32, 42, 58, 72, 73
17M8		6, 10, 11, 34, 59, 60, 72, 87, LM*
17M9		25, 29, 36, 37, 43, 46, 59, 65
17M10		11, 13, 20, 29, 57, 64, 67, 83
17M11		6, 13, 32, 41, 46, 76, 78, 87
17C1		7, 21, 30, 38, 65, 66, 77
17C2		19, 27, 33, 35, 42, 53, 77
17C3		22, 24, 27, 38, 49, 52, 90
17C4		10, 26, 35, 45, 54, 66, 90
17C5		22, 28, 33, 46, 50, 66, 75
17C6		17, 21, 27, 54, 75, 79, 83

*Language Minority Probe booklet

Table A.12
(continued)

Block	Occurs in Booklets	
	Bridge	BIB Spiral
17H1		92
17H2		93
17H3		94
17H4		95
17L1		92
17L2		93
17L3		94
17L4		95

Table A.13
READING COGNITIVE ITEMS

FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N001501	R1	17	R1	25	R1	25
N001502	R1	18	R1	26	R1	26
N001503	R1	19	R1	27	R1	27
N001504	R1	20	R1	28	R1	28
N002001	R2	14	R1	22	R1	22
N002002	R2	15	R1	23	R1	23
N002003	R2	16	R1	24	R1	24
N002801	R2	17	R1	20	R1	20
N002802	R2	18	R1	21	R1	21
N003001	--	--	R2	18	R2	18
N003003	--	--	R2	19	R2	19
N003101	R3	12	R1	29	R1	29
N003102	R3	13	R1	30	R1	30
N003104	R3	14	R1	31	R1	31
N003105	R3	14	R1	31	R1	31
N003201	--	--	R5	12	R5	12
N003202	--	--	R5	13	R5	13
N003203	--	--	R5	14	R5	14
N003204	--	--	R5	15	R5	15
N004101	R2	19	--	--	--	--
N004601	--	--	R3	16	R3	16
N004602	--	--	R3	17	R3	17
N004603	--	--	R3	18	R3	18
N005001	--	--	R2	15	R2	15
N005002	--	--	R2	16	R2	16
N005003	--	--	R2	17	R2	17
N005701	--	--	R3	22	R3	22
N005702	--	--	R3	23	R3	23
N005703	--	--	R3	24	R3	24
N006001	--	--	R3	19	R3	19
N006002	--	--	R3	20	R3	20
N006003	--	--	R3	21	R3	21
N007101	--	--	R3	25	R3	25
N007102	--	--	R3	26	R3	26
N007103	--	--	R3	27	R3	27
N007104	--	--	R3	28	R3	28
N007301	--	--	R4	13	R4	13
N007302	--	--	R4	14	R4	14
N007303	--	--	R4	15	R4	15
N007304	--	--	R4	16	R4	16
N007305	--	--	R4	17	R4	17
N007306	--	--	R4	18	R4	18
N007401	--	--	R4	8	R4	8
N007402	--	--	R4	9	R4	9
N007403	--	--	R4	10	R4	10
N007404	--	--	R4	11	R4	11
N007405	--	--	R4	12	R4	12
N008201	--	--	R2	10	R2	10
N008202	--	--	R2	11	R2	11
N008203	--	--	R2	12	R2	12
N008204	--	--	R2	13	R2	13
N008205	--	--	R2	14	R2	14
N008601	R3	15	--	--	--	--
N008602	R3	16	--	--	--	--
N008603	R3	17	--	--	--	--
N008901	R1	15	--	--	--	--
N008902	R1	16	--	--	--	--
N009401	R2	13	--	--	--	--
N009801	R2	11	--	--	--	--
N010101	R5	11	--	--	--	--
N010102	R5	12	--	--	--	--
N010103	R5	13	--	--	--	--
N010201	R2	20	--	--	--	--
N010301	R2	10	--	--	--	--
N010401	R1	12	--	--	--	--
N010402	R1	13	--	--	--	--
N010403	R1	14	--	--	--	--
N010501	R3	8	--	--	--	--
N010502	R3	9	--	--	--	--
N010503	R3	10	--	--	--	--
N010504	R3	11	--	--	--	--
N010601	R6	10	--	--	--	--
N010602	R6	11	--	--	--	--
N010603	R6	12	--	--	--	--
N010604	R6	13	--	--	--	--
N010605	R6	14	--	--	--	--
N013001	R5	21	--	--	--	--
N013002	R5	22	--	--	--	--
N013003	R5	23	--	--	--	--
N013004	R5	24	--	--	--	--
N013301	R2	12	--	--	--	--
N013401	R6	15	R4	19	R4	19
N013402	R6	16	R4	20	R4	20
N013403	R6	17	R4	21	R4	21
N014201	R1	21	--	--	--	--
N014301	R5	18	--	--	--	--
N014302	R5	19	--	--	--	--
N014303	R5	20	--	--	--	--
N021101	R4	5	--	--	--	--
N021102	R4	6	--	--	--	--
N021103	R4	7	--	--	--	--
N021201	R4	13	R6	5	R6	5
N021202	R4	14	R6	6	R6	6
N021203	R4	15	R6	7	R6	7
N021204	R4	16	R6	8	R6	8
N021301	R4	8	R6	9	R6	9
N021302	R4	9	R6	10	R6	10
N021303	R4	10	R6	11	R6	11
N021304	R4	11	R6	12	R6	12
N021305	R4	12	R6	13	R6	13
N021306	R4	8	R6	9	R6	9
N021308	R4	9	R6	10	R6	10
N021309	R4	9	R6	10	R6	10
N021401	R5	14	--	--	--	--
N021402	R5	15	--	--	--	--
N021403	R5	16	--	--	--	--
N021404	R5	17	--	--	--	--
N021501	R6	5	--	--	--	--
N021502	R6	6	--	--	--	--
N021503	R6	7	--	--	--	--
N021504	R6	8	--	--	--	--
N021505	R6	9	--	--	--	--
N021601	--	--	R5	7	R5	7
N021602	--	--	R5	8	R5	8
N021603	--	--	R5	9	R5	9
N021604	--	--	R5	10	R5	10
N021605	--	--	R5	11	R5	11
N021701	--	--	R5	16	R5	16
N021702	--	--	R5	17	R5	17
N021703	--	--	R5	18	R5	18
N021801	--	--	R6	14	R6	14
N021802	--	--	R6	15	R6	15
N021803	--	--	R6	16	R6	16
N021804	--	--	R6	17	R6	17
N021805	--	--	R6	18	R6	18
N021806	--	--	R6	14	R6	14
N021810	--	--	R6	18	R6	18

Table A.14
MATHEMATICS COGNITIVE ITEMS

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N200101	--	--	--	--	M8	31
N200201	--	--	--	--	M1	26
N200401	M6	27	M6	35	--	--
N200501	--	--	--	--	M7	26
N200701	--	--	--	--	M8	48
N200702	--	--	--	--	M8	49
N200901	--	--	M7	44	M8	34
N201001	--	--	M8	57	M8	42
N201101	--	--	M6	42	M7	25
N201201	--	--	M7	53	--	--
N201301	--	--	--	--	M7	49
N201401	--	--	M7	39	M7	23
N201402	--	--	M7	40	M7	24
N201701	--	--	M9	45	M8	30
N201801	--	--	M6	44	--	--
N202501	--	--	M7	38	M7	27
N202701	--	--	--	--	M1	40
N202801	M7	15	--	--	--	--
N203001	--	--	M9	56	M8	50
N203201	--	--	M7	45	M7	18
N203601	--	--	M7	43	M7	29
N203701	--	--	M6	43	--	--
N203801	--	--	M8	37	M9	46
N204101	--	--	M7	18	M8	16
N204201	--	--	--	--	M1	42
N204401	--	--	--	--	M1	21
N204501	--	--	--	--	M9	48
N204601	M6	13	M6	17	--	--
N204701	--	--	M6	46	--	--
N204801	--	--	M6	40	--	--
N204901	M6	12	M6	16	--	--
N205001	--	--	M6	39	--	--
N205101	--	--	M8	31	M1	14
N205201	--	--	M7	22	M1	12
N205301	M6	10	M6	14	--	--
N205501	--	--	--	--	M1	11
N205801	--	--	--	--	M1	31
N205901	--	--	M7	42	M1	22
N206301	--	--	--	--	M9	58
N206501	--	--	M8	27	M8	25
N206601	M7	16	M7	28	M8	20
N206701	--	--	M8	46	M1	26
N206801	--	--	M8	19	M9	38
N207101	--	--	M9	36	M8	24
N207401	M6	18	M6	22	--	--
N207501	--	--	M6	48	--	--
N207601	--	--	M6	33	--	--
N207701	--	--	M7	48	--	--
N207801	M7	17	M7	24	M1	15
N208101	--	--	M9	41	M8	17
N208301	--	--	M8	48	M1	19
N208401	--	--	M6	34	--	--
N208501	--	--	M8	50	M8	47
N208601	--	--	M9	47	M8	38
N208801	--	--	--	--	M1	16
N208901	--	--	--	--	M1	34
N209101	M7	25	M9	48	--	--
N209301	--	--	--	--	M1	23
N209401	--	--	--	--	M8	32
N209501	--	--	M9	43	M1	18
N209601	--	--	--	--	M1	17
N209801	M7	20	M9	46	M9	44
N209901	--	--	--	--	M1	24
N210101	--	--	--	--	M8	46
N210301	--	--	--	--	M1	25
N210401	--	--	--	--	M1	20
N210601	--	--	--	--	M1	14
N210701	--	--	--	--	M1	16
N210901	--	--	--	--	M8	36
N211001	--	--	--	--	M1	46
N211501	--	--	--	--	M1	41
N211801	--	--	--	--	M1	32
N211901	--	--	--	--	M9	51
N212101	--	--	--	--	M1	45
N212201	--	--	--	--	M1	37
N212301	--	--	--	--	M1	40
N212501	--	--	--	--	M1	47
N212601	--	--	--	--	M1	43
N212701	--	--	--	--	M1	21
N212901	--	--	M9	32	M8	21
N212902	--	--	M9	33	M8	22
N212903	--	--	M9	34	M8	23
N213001	--	--	--	--	M8	27
N213101	--	--	M7	36	--	--
N213201	--	--	--	--	M8	29
N213401	--	--	--	--	M9	49
N213501	--	--	--	--	M9	50
N213601	--	--	M8	41	M9	40
N213701	--	--	--	--	M1	28
N214101	--	--	--	--	M1	19
N214301	M7	13	--	--	--	--
N214501	--	--	--	--	M1	30
N214701	--	--	M8	22	M9	39
N214801	--	--	--	--	M1	38
N214901	M7	27	M7	41	M9	45
N215001	M7	19	M9	39	M9	37
N215101	--	--	--	--	M1	29
N215301	M6	26	M6	32	--	--
N215401	M7	14	--	--	--	--
N215601	--	--	M8	36	M8	26
N215701	--	--	M8	24	M8	18
N216101	--	--	--	--	M7	33
N216201	--	--	--	--	M9	43
N216301	--	--	M9	51	M7	30
N216401	--	--	M9	49	M7	28
N216501	M6	17	M6	21	--	--
N216601	M6	22	M6	26	--	--
N216901	--	--	M7	55	M7	36
N217101	--	--	M8	51	M7	34
N217201	M6	16	M6	20	--	--
N217701	--	--	M7	52	M7	40
N217801	--	--	M7	54	M7	38
N218501	--	--	M8	47	M7	20
N218801	--	--	--	--	M1	22
N219001	--	--	--	--	M1	30
N219101	M6	11	M6	15	--	--
N219301	--	--	M8	49	M7	19
N219401	--	--	--	--	M1	38
N219501	--	--	--	--	M7	51
N219701	--	--	M9	53	M1	35
N219901	M5	24	--	--	--	--
N220001	M6	23	M6	27	--	--
N220101	M6	15	M6	19	--	--
N220201	--	--	--	--	M7	50
N220301	--	--	--	--	M9	55
N220401	--	--	M7	49	M7	32
N220501	--	--	M9	40	M7	22
N220601	--	--	--	--	M7	52
N220701	--	--	--	--	M7	37
N220801	--	--	--	--	M1	29
N220901	--	--	--	--	M7	53
N221001	--	--	--	--	M1	36
N221101	--	--	--	--	M1	48
N221201	--	--	--	--	M9	56
N221601	--	--	--	--	M9	57
N221701	--	--	--	--	M9	54
N221801	--	--	--	--	M9	61
N221901	--	--	M9	50	M9	47
N222101	--	--	--	--	M8	51
N222401	--	--	M8	21	M9	36
N222501	--	--	--	--	M8	39
N222801	--	--	--	--	M8	33
N223001	--	--	--	--	M1	33
N223101	--	--	--	--	M1	46
N223301	--	--	M8	39	M8	45
N223601	--	--	--	--	M1	43

Table A.14
(continued)

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N223801	--	--	--	--	M1	27
N224301	M5	16	--	--	--	--
N224401	--	--	M6	41	--	--
N224701	M4	25	--	--	--	--
N224702	M4	26	--	--	--	--
N224801	--	--	M8	18	M7	17
N225001	--	--	--	--	M7	44
N225301	--	--	--	--	M8	44
N225401	--	--	--	--	M1	39
N225601	--	--	M8	56	M7	39
N225901	--	--	M8	23	M1	17
N226001	--	--	--	--	M1	18
N226201	--	--	M7	47	M1	25
N226401	--	--	M9	35	M9	35
N227101	--	--	--	--	M1	35
N227201	--	--	M6	47	--	--
N227301	--	--	--	--	M7	31
N227401	--	--	--	--	M8	52
N227701	M6	20	M6	24	--	--
N227901	--	--	M6	31	--	--
N228001	M4	27	--	--	--	--
N228301	--	--	--	--	M7	42
N228501	--	--	M7	37	M8	28
N228701	--	--	--	--	M9	52
N228901	M4	28	--	--	--	--
N229001	--	--	M8	29	M9	41
N229101	M5	21	--	--	--	--
N229201	--	--	M8	42	M7	46
N229202	--	--	M8	43	M7	47
N229203	--	--	M8	44	M7	48
N229301	--	--	M8	45	M7	35
N229601	--	--	--	--	M1	44
N229801	--	--	--	--	M1	36
N229901	--	--	--	--	M1	37
N230001	--	--	--	--	M1	44
N230101	M6	14	M6	18	--	--
N230201	--	--	M8	35	M8	35
N230301	--	--	--	--	M9	60
N230401	--	--	--	--	M1	32
N230501	M6	9	M6	13	--	--
N230601	--	--	M9	52	M7	43
N230701	--	--	--	--	M1	28
N230801	--	--	--	--	M1	41
N231101	--	--	M7	27	M8	19
N231301	--	--	M9	54	M7	45
N231401	--	--	--	--	M1	39
N231501	--	--	M8	30	M1	13
N231701	M6	25	M6	29	--	--
N231801	--	--	M8	38	M8	43
N232001	--	--	--	--	M1	27
N232101	--	--	--	--	M8	41
N232601	--	--	--	--	M1	45
N232901	--	--	M7	33	M1	15
N233101	--	--	--	--	M1	42
N233401	--	--	--	--	M1	23
N233402	--	--	--	--	M1	24
N234101	M7	21	M9	37	M9	53
N234201	--	--	M8	20	M7	21
N234301	--	--	M9	55	M7	41
N234501	M6	28	M6	36	--	--
N234901	M7	22	M8	32	M8	37
N235101	--	--	M6	30	--	--
N235201	M5	22	--	--	--	--
N235301	--	--	M6	38	--	--
N235501	M5	19	--	--	--	--
N235601	M6	21	M6	25	--	--
N236101	--	--	M8	28	M8	40
N236201	--	--	M6	37	--	--
N236401	M6	19	M6	23	--	--
N236501	M7	11	--	--	--	--
N236901	M7	24	--	--	--	--
N237301	--	--	M6	28	--	--
N237401	--	--	M6	45	--	--
N237501	M6	24	--	--	--	--
N237601	M7	18	--	--	--	--
N237701	M5	23	--	--	--	--
N238001	M5	15	--	--	--	--
N238101	M7	26	--	--	--	--
N238201	M5	26	--	--	--	--
N238401	M5	25	--	--	--	--
N238701	M5	18	--	--	--	--
N238901	M5	14	--	--	--	--
N239101	M7	12	--	--	--	--
N239201	M5	12	--	--	--	--
N239301	M5	28	--	--	--	--
N239401	M5	13	--	--	--	--
N239501	M7	23	--	--	--	--
N239601	M7	28	--	--	--	--
N239801	M5	17	--	--	--	--
N239901	M5	20	--	--	--	--
N240001	M5	27	--	--	--	--
N250201	M4	19	M2	19	--	--
N250301	M2	20	--	--	--	--
N250501	--	--	M5	39	M5	39
N250601	M2	13	--	--	--	--
N250602	M2	14	--	--	--	--
N250603	M2	15	--	--	--	--
N250701	M1	7	M2	14	--	--
N250702	M1	8	M2	15	--	--
N250703	M1	9	M2	16	--	--
N250801	--	--	M4	16	M4	16
N250802	--	--	M4	17	M4	17
N250803	--	--	M4	18	M4	18
N250901	M2	17	M1	25	M6	11
N250902	M2	18	M1	26	M6	12
N250903	M2	19	M1	27	M6	13
N251101	--	--	--	--	M1	49
N251201	--	--	M5	26	M5	26
N251401	M2	16	--	--	--	--
N251601	M4	13	--	--	--	--
N251701	--	--	M8	40	M2	41
N251801	--	--	M5	32	M5	32
N251901	--	--	M7	26	--	--
N252001	M2	25	M2	40	--	--
N252101	M1	25	M1	41	--	--
N252201	--	--	M5	30	M5	30
N252601	M1	26	M5	40	M5	40
N252701	--	--	M8	55	M6	44
N252901	M4	23	M1	32	--	--
N253201	--	--	M4	42	M4	42
N253202	--	--	M5	37	M5	37
N253701	--	--	M2	22	--	--
N253801	--	--	M5	42	M5	42
N253901	--	--	--	--	M1	39
N253902	--	--	--	--	M1	40
N253903	--	--	--	--	M1	41
N253904	--	--	--	--	M1	42
N254001	--	--	M3	28	M2	21
N254301	--	--	M7	35	M1	33
N254501	--	--	M5	35	M5	35
N254601	--	--	M1	16	M2	15
N254602	--	--	M1	46	M1	27
N255101	--	--	M4	38	M4	38
N255301	--	--	--	--	M2	46
N255302	--	--	M4	37	M4	37
N255401	--	--	--	--	M6	43
N255501	--	--	--	--	M3	33
N255601	--	--	--	--	M2	45
N255701	--	--	M1	50	M1	32
N255801	--	--	--	--	M2	49
N255901	--	--	--	--	M1	33
N255902	--	--	--	--	M1	34
N256001	--	--	--	--	M3	34
N256101	--	--	M2	17	M1	15
N256301	--	--	M4	19	M4	19
N256501	--	--	M3	30	M6	35

Table A.14
(continued)

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N256801	M4	21	M3	32	M1	36
N257101	--	--	--	--	M3	35
N257201	M1	11	--	--	--	--
N257401	--	--	M7	23	--	--
N257601	--	--	M1	35	--	--
N257701	M4	22	--	--	--	--
N257801	M2	3	--	--	--	--
N257901	--	--	M5	23	M5	23
N258201	--	--	M4	39	M4	39
N258501	M3	19	--	--	--	--
N258801	--	--	M1	38	M2	36
N258802	--	--	M2	31	M1	26
N258803	--	--	M2	41	M1	37
N258804	--	--	M7	20	M1	18
N258901	--	--	M4	31	M4	31
N259001	--	--	--	--	M2	31
N259101	M4	16	--	--	--	--
N259501	--	--	M5	36	M5	36
N259901	--	--	M7	34	M1	28
N259921	--	--	M3	20	M3	22
N260101	--	--	M1	43	M2	20
N260301	--	--	M8	53	--	--
N260601	--	--	M7	21	M1	16
N260701	--	--	M5	33	M5	33
N260801	--	--	--	--	M2	43
N260901	--	--	M8	54	M1	35
N260902	--	--	M4	40	M4	40
N261001	--	--	M1	47	M2	40
N261201	--	--	M2	38	M2	26
N261301	--	--	M2	37	M2	28
N261401	M2	12	--	--	--	--
N261501	--	--	M2	34	M2	24
N261601	--	--	M2	36	M2	27
N261801	--	--	M2	35	M2	25
N262001	--	--	--	--	M9	42
N262201	M1	10	M2	18	--	--
N262301	--	--	M7	19	M2	17
N262401	M3	18	M1	28	M1	17
N262501	M1	19	M1	33	M2	35
N262502	M1	20	M1	34	M2	36
N262601	--	--	M7	46	M1	38
N262701	--	--	M4	15	M4	15
N262801	--	--	M4	20	M4	20
N262802	--	--	M4	21	M4	21
N262803	--	--	M4	22	M4	22
N263001	--	--	M7	51	M1	43
N263101	--	--	M1	39	M2	37
N263201	--	--	--	--	M2	18
N263202	--	--	--	--	M2	19
N263401	M2	4	M2	12	--	--
N263402	M2	5	M2	13	--	--
N263501	M4	24	M2	30	M6	34
N263801	--	--	M4	43	M4	43
N263901	--	--	M4	30	M4	30
N264301	--	--	M8	58	M1	47
N264321	--	--	M9	28	M3	29
N264501	--	--	M7	29	--	--
N264521	--	--	M3	19	M3	23
N264601	--	--	M4	34	M4	34
N264701	--	--	M2	33	M2	39
N265201	M4	14	M1	36	--	--
N265202	--	--	M1	30	--	--
N265401	M1	21	--	--	--	--
N265901	--	--	M1	40	M6	39
N265902	--	--	M3	31	M6	42
N265903	--	--	M5	31	M5	31
N266001	--	--	M5	38	M5	38
N266101	M1	22	M3	27	M6	24
N266501	--	--	--	--	M3	31
N266701	--	--	M4	32	M4	32
N266801	--	--	M1	31	M2	16
N267001	M3	16	--	--	--	--
N267201	--	--	M1	23	--	--
N267301	M4	12	--	--	--	--
N267601	M1	3	--	--	--	--
N267602	M1	18	--	--	--	--
N267801	--	--	--	--	M1	20
N267901	--	--	M5	41	M5	41
N267921	--	--	--	--	M3	30
N268201	M1	24	M8	16	--	--
N268221	M3	14	M9	20	--	--
N268801	--	--	--	--	M2	48
N268901	--	--	--	--	M2	47
N269001	M2	26	M1	44	M2	22
N269101	M1	23	M2	26	--	--
N269201	--	--	M2	44	M6	41
N269401	--	--	M9	57	M9	59
N269901	--	--	M3	29	--	--
N270001	M1	14	--	--	--	--
N270301	--	--	M2	20	M1	30
N270302	--	--	M2	21	M1	31
N270701	--	--	--	--	M6	37
N270702	--	--	--	--	M6	38
N270901	M1	1	--	--	--	--
N270902	M4	15	--	--	--	--
N271101	M2	24	M7	17	--	--
N271301	--	--	M9	44	M3	32
N271401	--	--	M4	33	M4	33
N272101	M3	17	--	--	--	--
N272102	M1	15	--	--	--	--
N272301	M2	1	--	--	--	--
N272302	M4	11	--	--	--	--
N272601	M4	17	--	--	--	--
N272801	M3	15	--	--	--	--
N273501	M2	6	--	--	--	--
N273901	--	--	M1	37	M6	36
N273902	--	--	M5	25	M5	25
N274101	--	--	M7	25	--	--
N274801	--	--	M1	29	M6	25
N274802	--	--	M5	29	M5	29
N275001	--	--	M1	42	--	--
N275301	--	--	M3	25	--	--
N275401	M2	7	--	--	--	--
N276001	M2	21	--	--	--	--
N276002	M2	22	--	--	--	--
N276021	M3	9	--	--	--	--
N276022	M3	10	--	--	--	--
N276101	M1	12	--	--	--	--
N276501	M4	18	--	--	--	--
N276601	M2	2	--	--	--	--
N276801	M1	4	M1	17	M6	17
N276802	M1	5	M1	18	M6	18
N276803	M1	6	M1	19	M6	19
N276821	M3	4	M3	9	M3	12
N276822	M3	5	M3	10	M3	13
N276823	M3	6	M3	11	M3	14
N277401	M1	2	M2	8	--	--
N277501	M2	8	--	--	--	--
N277601	M2	9	M1	20	M6	20
N277602	M2	10	M1	21	M6	21
N277603	M2	11	M1	22	M6	22
N277621	M3	11	M9	17	M9	24
N277622	M3	12	M9	18	M9	25
N277623	M3	13	M9	19	M9	26
N277901	M4	8	M2	9	M6	14
N277902	M4	9	M2	10	M6	15
N277903	M4	10	M2	11	M6	16
N278301	--	--	M4	35	M4	35
N278302	--	--	M4	36	M4	36
N278501	--	--	M7	30	M1	23
N278502	--	--	M7	31	M1	24
N278503	--	--	M7	32	M1	25
N278901	--	--	M2	32	M2	23
N278902	--	--	M2	29	M2	42
N278903	--	--	M2	42	M2	44
N278904	--	--	M1	49	M6	45

Table A.14
(continued)

FIELD	COHORT 1 BLOCK	COHORT 1 ITEM	COHORT 2 BLOCK	COHORT 2 ITEM	COHORT 3 BLOCK	COHORT 3 ITEM
N278905	--	--	M8	52	M1	44
N278921	--	--	M3	18	M3	21
N278922	--	--	M3	22	M3	24
N278923	--	--	M3	21	M3	26
N278924	--	--	M3	24	M3	28
N278925	--	--	M3	23	M3	27
	--	--	M9	30	--	--
N279301	--	--	M5	34	M1	31
	--	--	--	--	M5	34
N279321	--	--	M9	29	M9	29
N279401	--	--	M5	43	M5	43
N279421	--	--	M8	31	M9	30
N280401	--	--	M8	33	M2	30
N280421	--	--	M9	26	M9	28
N280601	--	--	M4	23	M4	23
N280602	--	--	M4	24	M4	24
N280603	--	--	M4	25	M4	25
N280604	--	--	M4	26	M4	26
N280605	--	--	M4	27	M4	27
N280606	--	--	M4	28	M4	28
N280621	--	--	M3	12	M3	15
N280622	--	--	M3	13	M3	16
N280623	--	--	M3	14	M3	17
N280624	--	--	M3	15	M3	18
N280625	--	--	M3	16	M3	19
N280626	--	--	M3	17	M3	20
N281401	--	--	M2	39	M2	29
N281901	--	--	M1	15	--	--
N282201	--	--	M2	28	M6	27
N282202	--	--	M3	26	M9	34
N282701	--	--	M5	24	M5	24
N282801	--	--	--	--	M1	48
N282901	M4	20	--	--	--	--
N283001	--	--	M9	42	--	--
N283101	--	--	M1	51	M6	40
N284001	M1	16	--	--	M1	12
N284002	M1	17	--	--	M1	13
N284021	M3	7	--	--	M9	32
N284022	M3	8	--	--	M9	33
N284101	--	--	M5	18	M5	18
N284102	--	--	M5	19	M5	19
N284401	--	--	M5	27	M6	26
	--	--	--	--	M5	27
N284421	--	--	M9	24	M9	27
N284501	--	--	M5	20	M6	31
	--	--	--	--	M5	20
N284502	--	--	M5	21	M6	32
	--	--	--	--	M5	21
N284503	--	--	M5	22	M6	33
	--	--	--	--	M5	22
N284521	--	--	M9	21	M9	21
N284522	--	--	M9	22	M9	22
N284523	--	--	M9	23	M9	23
N285001	--	--	M5	28	M5	28
N285021	--	--	M9	25	M9	31
N285201	--	--	M4	29	M4	29
N285301	--	--	M7	50	--	--
N285321	--	--	M9	27	M3	25
N285401	--	--	M4	41	M4	41
N285701	--	--	M2	27	M1	21
N285901	--	--	--	--	M6	46
N286001	--	--	--	--	M1	19
N286002	--	--	--	--	M1	20
N286101	M1	13	--	--	--	--
N286102	M2	23	M8	17	--	--
N286201	--	--	M1	24	M6	23
N286301	--	--	M1	45	M2	33
N286302	--	--	--	--	M1	22
N286501	--	--	M1	48	M2	34
N286502	--	--	M2	43	M1	34
N286601	--	--	M2	23	M6	28
N286602	--	--	M2	24	M6	29
N286603	--	--	M2	25	M6	30
N287101	--	--	M8	34	M1	29
N287102	--	--	M9	38	M2	32
N287301	--	--	M8	25	M1	45
N287302	--	--	M8	26	M1	46

Table A.15
SCIENCE COGNITIVE ITEMS

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N400001	S1	6	--	--	--	--
N400101	S1	15	--	--	--	--
N400102	S1	16	--	--	--	--
N400201	S1	7	S1	16	S1	12
N400301	S1	8	--	--	--	--
N400401	S1	9	--	--	--	--
N400402	S1	10	--	--	--	--
N400403	S1	11	--	--	--	--
N400404	S1	12	--	--	--	--
N400405	S1	13	--	--	--	--
N400501	S1	14	--	--	--	--
N400601	S1	17	--	--	--	--
N400701	S1	18	--	--	--	--
N400901	S1	19	--	--	--	--
N401001	S1	20	--	--	--	--
N401101	S1	21	--	--	--	--
N401201	S1	22	S1	28	S1	30
N401301	S1	23	--	--	--	--
N401501	S2	1	--	--	--	--
N401601	S2	2	--	--	--	--
N401701	S2	3	--	--	--	--
N401702	S2	4	--	--	--	--
N401703	S2	5	--	--	--	--
N401801	S2	6	--	--	--	--
N401802	S2	7	--	--	--	--
N401803	S2	8	--	--	--	--
N401804	S2	9	--	--	--	--
N401901	S2	10	--	--	--	--
N402001	S2	11	--	--	--	--
N402002	S2	12	--	--	--	--
N402003	S2	13	--	--	--	--
N402004	S2	14	--	--	--	--
N402005	S2	15	--	--	--	--
N402101	S2	16	--	--	--	--
N402201	S2	17	--	--	--	--
N402401	S2	18	--	--	--	--
N402501	S2	19	--	--	--	--
N402601	S2	20	--	--	--	--
N402602	S2	21	--	--	--	--
N402603	S2	22	--	--	--	--
N402701	S2	23	--	--	--	--
N402801	S2	24	--	--	--	--
N402901	S2	25	--	--	--	--
N403001	S3	12	--	--	--	--
N403101	S3	13	--	--	--	--
N403201	S3	14	--	--	--	--
N403202	S3	15	--	--	--	--
N403301	S3	16	--	--	--	--
N403401	S3	17	--	--	--	--
N403501	S3	18	--	--	--	--
N403502	S3	19	--	--	--	--
N403503	S3	20	--	--	--	--
N403601	S3	21	--	--	--	--
N403701	S3	22	--	--	--	--
N403702	S3	23	--	--	--	--
N403703	S3	24	--	--	--	--
N403801	S3	25	--	--	--	--
N403802	S3	26	--	--	--	--
N403803	S3	27	--	--	--	--
N403804	S3	28	--	--	--	--
N403901	S3	29	--	--	--	--
N404001	S3	30	--	--	--	--
N404201	S3	31	--	--	--	--
N404501	--	--	S1	12	--	--
N404601	--	--	S1	13	S1	13
N404701	--	--	S1	14	--	--
N404702	--	--	S1	15	--	--
N404801	--	--	S1	20	--	--
N404802	--	--	S1	21	--	--
N404803	--	--	S1	22	--	--
N404901	--	--	S1	17	--	--
N404902	--	--	S1	18	--	--
N404903	--	--	S1	19	--	--
N405001	--	--	S1	23	S1	29
N405101	--	--	S1	24	S3	14
N405201	--	--	S1	25	S1	31
N405301	--	--	S1	26	--	--
N405401	--	--	S1	27	S3	19
N405501	--	--	S1	29	S3	21
N405601	--	--	S1	30	--	--
N405701	--	--	S1	31	--	--
N405801	--	--	S1	32	--	--
N405901	--	--	S1	33	--	--
N406001	--	--	S1	34	S1	33
N406101	--	--	S1	35	S1	35
N406201	--	--	S1	36	S1	37
N406301	--	--	S2	10	S1	21
N406302	--	--	S2	11	S1	22
N406303	--	--	S2	12	S1	23
N406304	--	--	S2	13	S1	24
N406401	--	--	S2	14	S2	10
N406402	--	--	S2	15	S2	11
N406403	--	--	S2	16	S2	12
N406404	--	--	S2	17	S2	13
N406405	--	--	S2	18	S2	14
N406501	--	--	S2	19	--	--
N406601	--	--	S2	20	S1	28
N406701	--	--	S2	21	--	--
N406801	--	--	S2	22	S2	16
N406802	--	--	S2	23	S2	17
N406803	--	--	S2	24	S2	18
N406804	--	--	S2	25	S2	19
N406805	--	--	S2	26	S2	20
N406806	--	--	S2	27	S2	21
N406901	--	--	S2	28	S2	27
N407001	--	--	S2	29	S2	33
N407101	--	--	S2	30	S2	38
N407201	--	--	S2	31	S2	32
N407301	--	--	S2	32	S2	36
N407302	--	--	S2	33	S2	37
N407401	--	--	--	--	S2	28
N407402	--	--	--	--	S2	29
N407403	--	--	--	--	S2	30
N407404	--	--	--	--	S2	31
N407501	--	--	S2	36	--	--
N407601	--	--	S2	35	--	--
N407701	--	--	S2	37	S2	35
N407801	--	--	S2	38	--	--
N407901	--	--	S2	39	--	--
N408001	--	--	S2	34	--	--
N408101	--	--	--	--	S1	38
N408201	--	--	S2	40	--	--
N408301	--	--	S3	10	S3	10
N408302	--	--	S3	11	S3	11
N408303	--	--	S3	12	S3	12
N408304	--	--	S3	13	S3	13
N408401	--	--	S3	14	--	--
N408501	--	--	S3	15	--	--
N408502	--	--	S3	16	--	--
N408601	--	--	S3	17	S1	19
N408701	--	--	S3	18	--	--
N408801	--	--	S3	19	S3	24
N408901	--	--	S3	20	S3	15
N408902	--	--	S3	21	S3	16
N408903	--	--	S3	22	S3	17
N408904	--	--	S3	23	S3	18
N409001	--	--	S3	24	--	--
N409101	--	--	S3	25	--	--
N409102	--	--	S3	26	--	--
N409103	--	--	S3	27	--	--
N409201	--	--	S3	28	--	--
N409301	--	--	S3	29	S1	20
N409401	--	--	S3	30	--	--
N409402	--	--	S3	31	--	--
N409403	--	--	S3	32	--	--
N409501	--	--	S3	33	S1	34

Table A.15
(continued)

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N409601	--	--	S3	34	--	--
N409701	--	--	S3	35	--	--
N409801	--	--	S3	36	--	--
N409901	--	--	--	--	S1	18
N410001	--	--	--	--	S1	14
N410002	--	--	--	--	S1	15
N410003	--	--	--	--	S1	16
N410004	--	--	--	--	S1	17
N410101	--	--	--	--	S1	25
N410102	--	--	--	--	S1	26
N410103	--	--	--	--	S1	27
N410201	--	--	--	--	S1	32
N410301	--	--	--	--	S1	36
N410401	--	--	--	--	S2	15
N410501	--	--	--	--	S2	22
N410601	--	--	--	--	S2	23
N410602	--	--	--	--	S2	24
N410603	--	--	--	--	S2	25
N410604	--	--	--	--	S2	26
N410701	--	--	--	--	S2	34
N410801	--	--	--	--	S2	39
N410901	--	--	--	--	S2	40
N411001	--	--	--	--	S2	41
N411101	--	--	--	--	S3	22
N411201	--	--	--	--	S3	23
N411301	--	--	--	--	S3	20
N411401	--	--	--	--	S3	25
N411501	--	--	--	--	S3	26
N411502	--	--	--	--	S3	27
N411601	--	--	--	--	S3	28
N411701	--	--	--	--	S3	29
N411801	--	--	--	--	S3	30
N411901	--	--	--	--	S3	31
N412001	--	--	--	--	S3	32
N412101	S4	10	S4	10	--	--
N412201	S4	11	S4	11	--	--
N412301	S4	21	S4	21	--	--
N412501	S6	13	--	--	--	--
N412601	--	--	S4	24	--	--
N412701	S4	22	S4	22	--	--
N412801	S4	14	S4	14	--	--
N412901	S4	13	S4	13	--	--
N413001	--	--	S9	16	--	--
N413101	--	--	S9	19	--	--
N413201	S4	17	S4	17	--	--
N413301	S4	18	S4	18	--	--
N413401	S4	19	S4	19	--	--
N413601	S4	12	S4	12	--	--
N413602	S4	12	S4	12	--	--
N413701	S4	23	S9	18	S1	12
N413901	S5	5	--	--	--	--
N414001	--	--	S4	25	--	--
N414101	S5	6	--	--	--	--
N414201	S5	19	--	--	--	--
N414301	S5	13	--	--	--	--
N414401	S5	17	S6	23	S6	23
N414501	S5	16	--	--	--	--
N414601	S5	15	--	--	--	--
N414701	S5	12	S7	12	--	--
N414801	S5	8	--	--	--	--
N414901	S5	7	--	--	--	--
N415101	S5	14	--	--	--	--
N415401	S6	11	--	--	--	--
N415501	S4	16	S4	16	--	--
N415601	S6	18	--	--	--	--
N415701	S6	14	--	--	--	--
N415801	S6	6	--	--	--	--
N416001	S6	7	--	--	--	--
N416101	S6	16	--	--	--	--
N416301	S6	10	--	--	--	--
N416401	--	--	S4	26	--	--
N416501	S6	12	--	--	--	--
N416601	S6	19	--	--	--	--

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N416701	S6	15	--	--	--	--
N416702	S6	15	--	--	--	--
N416801	--	--	S6	25	S6	25
N416901	--	--	S6	24	S6	24
N417001	--	--	S6	18	S6	18
N417101	--	--	S6	27	S6	27
N417201	--	--	S6	28	S6	28
N417301	--	--	S6	14	S6	14
N417401	--	--	S9	30	S1	26
N417601	--	--	S6	13	S6	13
N417701	--	--	S6	21	S6	21
N417801	--	--	S6	19	S6	19
N417901	--	--	S6	26	S6	26
N418001	--	--	S6	15	S6	15
N418101	--	--	S6	22	S6	22
N418201	--	--	S6	17	S6	17
N418301	--	--	S6	12	S6	12
N418401	--	--	S6	11	S6	11
N418501	--	--	S6	20	S6	20
N418701	--	--	S5	11	S5	11
N418702	--	--	S5	12	S5	12
N418801	--	--	S5	18	S5	18
N418901	--	--	S5	5	S5	5
N419001	--	--	S5	8	S5	8
N419101	--	--	S5	13	S5	13
N419201	--	--	S5	4	S5	4
N419301	--	--	S5	7	S5	7
N419401	--	--	S5	9	S5	9
N419501	--	--	S5	3	S5	3
N419601	--	--	S5	19	S5	19
N419701	--	--	S5	16	S5	16
N419801	--	--	S5	2	S5	2
N419901	--	--	S5	17	S5	17
N420001	--	--	S5	15	S5	15
N420101	--	--	S5	10	S5	10
N420201	--	--	S5	14	S5	14
N420301	--	--	S7	23	--	--
N420401	--	--	S7	19	--	--
N420501	--	--	S7	20	--	--
N420601	--	--	S7	13	--	--
N420701	--	--	S7	22	--	--
N420702	--	--	S7	22	--	--
N420901	--	--	S7	25	--	--
N421101	--	--	S7	11	--	--
N421201	--	--	S7	21	--	--
N421301	--	--	S7	14	--	--
N421302	--	--	S7	15	--	--
N421401	--	--	S7	17	--	--
N421501	--	--	S7	27	--	--
N421601	--	--	S8	32	S4	24
N421701	--	--	S7	24	S8	26
N421801	--	--	S7	10	--	--
N421901	--	--	S7	16	S4	14
N422001	--	--	S7	26	--	--
N422101	--	--	S8	16	S1	11
N422201	--	--	S8	19	S1	17
N422301	--	--	S8	25	--	--
N422401	--	--	S8	26	S8	27
N422501	--	--	S8	22	--	--
N422601	--	--	S8	31	--	--
N422701	--	--	S8	20	--	--
N422801	--	--	S8	30	--	--
N422901	--	--	S8	29	--	--
N423001	--	--	S8	21	--	--
N423101	--	--	S8	17	--	--
N423201	--	--	S8	24	--	--
N423202	--	--	S8	24	--	--
N423301	--	--	S8	23	--	--
N423401	--	--	S8	15	--	--
N423501	--	--	S8	18	--	--
N423601	--	--	S8	27	--	--
N423701	--	--	S8	28	--	--
N423801	--	--	--	--	S9	18

Table A.15
(continued)

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N423901	--	--	--	--	S9	22
N423902	--	--	--	--	S9	23
N424001	--	--	--	--	S9	34
N424201	--	--	--	--	S9	36
N424301	--	--	--	--	S9	19
N424401	--	--	--	--	S9	31
N424501	--	--	--	--	S9	27
N424701	--	--	--	--	S9	21
N424801	--	--	--	--	S9	24
N424802	--	--	--	--	S9	25
N424803	--	--	--	--	S9	25
N424901	--	--	--	--	S9	28
N425001	--	--	--	--	S9	20
N425101	--	--	--	--	S9	35
N425201	--	--	--	--	S9	26
N425301	--	--	--	--	S9	30
N425401	--	--	--	--	S9	33
N425501	--	--	--	--	S9	29
N425601	--	--	--	--	S1	27
N425701	--	--	--	--	S1	30
N425702	--	--	--	--	S1	30
N425801	--	--	--	--	S1	25
N425901	--	--	--	--	S1	22
N426001	--	--	--	--	S1	31
N426101	--	--	--	--	S1	16
N426201	--	--	--	--	S1	32
N426401	--	--	--	--	S1	20
N426501	--	--	--	--	S1	26
N426601	--	--	--	--	S9	32
N426801	--	--	--	--	S1	29
N426901	--	--	--	--	S1	28
N427001	--	--	--	--	S1	21
N427101	--	--	--	--	S1	23
N427201	--	--	--	--	S1	18
N427202	--	--	--	--	S1	19
N427301	--	--	--	--	S1	35
N427401	--	--	--	--	S1	24
N427501	--	--	--	--	S7	20
N427601	--	--	--	--	S7	19
N427701	--	--	--	--	S7	35
N427801	--	--	--	--	S7	18
N427901	--	--	--	--	S7	32
N428001	--	--	--	--	S7	25
N428101	--	--	--	--	S7	21
N428102	--	--	--	--	S7	22
N428201	--	--	--	--	S7	26
N428202	--	--	--	--	S7	26
N428301	--	--	--	--	S7	27
N428401	--	--	--	--	S7	34
N428501	--	--	--	--	S7	23
N428601	--	--	--	--	S7	30
N428801	--	--	--	--	S7	28
N428901	--	--	--	--	S7	24
N429001	--	--	--	--	S7	37
N429101	--	--	--	--	S7	36
N429201	--	--	--	--	S7	31
N429401	--	--	--	--	S4	19
N429601	--	--	--	--	S4	25
N429701	--	--	--	--	S4	29
N429801	--	--	--	--	S4	27
N429901	--	--	--	--	S4	13
N430001	--	--	--	--	S4	20
N430002	--	--	--	--	S4	21
N430003	--	--	--	--	S4	22
N430101	--	--	--	--	S4	23
N430301	--	--	--	--	S4	30
N430401	--	--	--	--	S4	12
N430501	--	--	--	--	S4	26
N430601	--	--	--	--	S4	28
N430801	--	--	--	--	S4	17
N430802	--	--	--	--	S4	17
N430901	--	--	--	--	S4	31
N431101	--	--	--	--	S8	31
N431201	--	--	--	--	S8	14
N431301	--	--	--	--	S8	19
N431302	--	--	--	--	S8	19
N431401	--	--	--	--	S8	20
N431501	--	--	--	--	S8	15
N431801	--	--	--	--	S8	28
N431901	--	--	--	--	S8	17
N431902	--	--	--	--	S8	18
N432001	--	--	--	--	S1	28
N432101	--	--	--	--	S8	16
N432201	--	--	--	--	S8	23
N432301	--	--	--	--	S8	30
N432401	--	--	--	--	S8	25
N432501	--	--	--	--	S8	32
N432601	--	--	--	--	S8	22
N432701	--	--	--	--	S8	21
N432801	--	--	--	--	S8	29
N432901	--	--	--	--	S8	24
N433001	S5	11	--	--	--	--
N433101	S5	18	--	--	--	--
N433201	S6	17	--	--	--	--
N433301	S6	5	--	--	--	--
N433401	S6	8	--	--	--	--
N433501	S6	9	--	--	--	--
N433601	S4	20	S4	20	--	--
N433701	--	--	S7	18	--	--
N433801	--	--	--	--	S4	16
N433901	--	--	--	--	S7	33
N434001	--	--	--	--	S7	29
N434101	--	--	--	--	S8	33
N434201	--	--	--	--	S1	33
N434202	--	--	--	--	S1	34
N434301	--	--	--	--	S4	18
N434401	S4	15	S4	15	--	--
N434501	S5	9	--	--	--	--
N434502	S5	9	--	--	--	--
N434601	S5	10	--	--	--	--
N434801	--	--	--	--	S4	15
N434901	--	--	S4	27	--	--
N435001	--	--	S4	23	--	--
N435101	--	--	S6	16	S6	16
N435201	--	--	S5	6	S5	6
N435301	--	--	--	--	S9	37
N435401	--	--	S9	14	S1	10
N435501	--	--	S9	15	--	--
N435601	--	--	S9	20	--	--
N435701	--	--	S9	21	--	--
N435801	--	--	S9	22	S1	20
N435901	--	--	S9	23	S1	23
N436001	--	--	S9	24	--	--
N436107	--	--	S9	25	--	--
N436201	--	--	S9	26	S1	24
N436301	--	--	S9	27	--	--
N436401	--	--	S9	28	S1	22
N436501	--	--	S9	29	S1	21
N436601	--	--	S9	31	--	--
N436701	--	--	S9	17	--	--
N436801	--	--	--	--	S1	13
N436802	--	--	--	--	S1	14
N436901	--	--	--	--	S1	15
N437001	--	--	--	--	S1	16
N437002	--	--	--	--	S1	16
N437101	--	--	--	--	S1	17
N437201	--	--	--	--	S1	18
N437202	--	--	--	--	S1	19
N437301	--	--	--	--	S1	25
N437401	--	--	--	--	S1	27
N437501	--	--	--	--	S1	29
N437601	S7	8	--	--	--	--
N437701	S7	9	--	--	--	--
N437801	S7	10	--	--	--	--
N437901	S7	11	--	--	--	--
N438001	S7	12	--	--	--	--

Table A.15
(continued)

FIELD	COHORT 1 BLOCK	ITEM	COHORT 2 BLOCK	ITEM	COHORT 3 BLOCK	ITEM
N438101	S7	13	--	--	--	--
N438201	S7	14	--	--	--	--
N438301	S7	15	--	--	--	--
N438401	S7	16	--	--	--	--
N438501	S7	17	--	--	--	--
N438601	S7	18	--	--	--	--
N438701	S7	19	--	--	--	--
N438801	S7	20	--	--	--	--
N438901	S7	21	--	--	--	--

Table A.16
COMPUTER COMPETENCE COGNITIVE ITEMS

FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N600101	C1	20	C1	21	C1	21
N600102	C1	21	C1	22	C1	22
N600103	C1	22	C1	23	C1	23
N600104	C1	23	C1	24	C1	24
N600105	C1	24	C1	25	C1	25
N600106	C1	25	C1	26	C1	26
N600201	C2	14	C2	14	C2	14
N600301	C2	15	C2	15	C2	15
N600401	C2	16	C2	16	C2	16
N600501	C2	17	C2	17	C2	17
N600601	C2	18	C2	18	C2	18
N600701	--	--	C2	19	C2	19
N600801	C3	12	C4	6	--	--
N600901	C3	13	C4	7	--	--
N600902	C3	14	C4	8	--	--
N601001	C3	15	C4	9	--	--
N601101	C3	16	C4	10	--	--
N601201	--	--	C3	1	C3	1
N601301	--	--	C3	2	C3	2
N601401	--	--	C3	3	C3	3
N601501	--	--	C3	4	C3	4
N601601	--	--	C3	13	C3	13
N601602	--	--	C3	14	C3	14
N601603	--	--	C3	15	C3	15
N601701	--	--	C4	11	C5	19
N601702	--	--	C4	12	C5	20
N601703	--	--	C4	13	C5	21
N601704	--	--	C4	14	C5	22
N601705	--	--	C4	15	C5	23
N601706	--	--	C4	16	C5	24
N601707	--	--	C4	17	C5	25
N601708	--	--	C4	18	C5	26
N601709	--	--	C4	19	C5	27
N601801	--	--	--	--	C4	22
N601901	--	--	--	--	C4	23
N602001	--	--	--	--	C4	29
N602101	--	--	--	--	C4	27
N602201	--	--	C6	15	C4	28
N602301	--	--	C5	7	--	--
N602401	--	--	C5	8	--	--
N602501	--	--	C5	9	--	--
N602601	--	--	C5	12	C5	28
N602701	--	--	C5	17	C5	32
N602801	--	--	C6	11	--	--
N602802	--	--	C6	12	--	--
N602803	--	--	C6	13	--	--
N602804	--	--	C6	14	--	--
N602901	--	--	C6	20	--	--
N603001	--	--	--	--	C6	19
N603002	--	--	--	--	C6	20
N603003	--	--	--	--	C6	21
N603004	--	--	--	--	C6	22
N603005	--	--	--	--	C6	23
N603101	C1	19	C1	20	C1	20
N603201	C1	26	C1	27	C1	27
N603202	C1	27	C1	28	C1	28
N603203	C1	28	C1	29	C1	29
N603204	C1	29	C1	30	C1	30
N603301	C2	19	C2	20	C2	20
N603302	C2	20	C2	21	C2	21
N603303	C2	21	C2	22	C2	22
N603401	C2	22	C2	23	C2	23
N603402	C2	23	C2	24	C2	24
N603501	C3	17	--	--	--	--
N603502	C3	18	--	--	--	--
N603503	C3	19	--	--	--	--
N603504	C3	20	--	--	--	--
N603601	C3	21	--	--	--	--
N603701	--	--	C3	5	C3	5
N603702	--	--	C3	6	C3	6
N603703	--	--	C3	7	C3	7
N603704	--	--	C3	8	C3	8
N603705	--	--	C3	9	C3	9
N603706	--	--	C3	10	C3	10
N603707	--	--	C3	11	C3	11
N603708	--	--	C3	12	C3	12
N603801	--	--	C4	20	--	--
N603901	--	--	C4	21	--	--
N604001	--	--	C4	22	--	--
N604002	--	--	C4	23	--	--
N604003	--	--	C4	24	--	--
N604101	--	--	--	--	C4	30
N604201	--	--	--	--	C4	24
N604202	--	--	--	--	C4	25
N604203	--	--	--	--	C4	26
N604301	--	--	C5	13	--	--
N604401	--	--	C5	14	C5	29
N604402	--	--	C5	15	C5	30
N604501	--	--	C5	16	C5	31
N604601	--	--	C6	16	C6	24
N604602	--	--	C6	17	C6	25
N604701	--	--	C6	18	C6	18
N604801	--	--	C6	19	--	--
N604901	C1	32	C1	33	C1	33
N605001	C1	33	C1	34	C1	34
N605101	C1	34	C1	35	C1	35
N605201	C1	35	C1	36	C1	36
N605301	C1	36	C1	37	C1	37
N605302	C1	36	C1	37	C1	37
N605401	C2	26	C2	27	--	--
N605501	C2	27	C2	28	--	--
N605601	C2	28	C2	29	--	--
N605602	C2	29	C2	30	--	--
N605701	C2	30	C2	31	--	--
N605702	C2	30	C2	31	--	--
N605801	--	--	--	--	C2	27
N605901	--	--	--	--	C2	28
N606001	--	--	--	--	C2	29
N606101	--	--	--	--	C2	30
N606102	--	--	--	--	C2	31
N606103	--	--	--	--	C2	32
N606104	--	--	--	--	C2	30
N606106	--	--	--	--	C2	31
N606108	--	--	--	--	C2	32
N606201	C3	24	--	--	--	--
N606301	C3	25	--	--	--	--
N606401	C3	26	--	--	--	--
N606501	C3	27	--	--	--	--
N606601	C3	28	--	--	--	--
N606701	--	--	C3	20	C3	20
N606702	--	--	C3	21	C3	21
N606703	--	--	C3	22	C3	22
N606704	--	--	C3	23	C3	23
N606801	--	--	C3	24	C3	24
N606901	--	--	C4	27	--	--
N607001	--	--	C4	28	--	--
N607101	--	--	C4	29	--	--
N607102	--	--	C4	30	--	--
N607201	--	--	C4	31	--	--
N607301	--	--	--	--	C4	33
N607302	--	--	--	--	C4	34
N607303	--	--	--	--	C4	35
N607304	--	--	--	--	C4	36
N607305	--	--	--	--	C4	37
N607306	--	--	--	--	C4	38
N607307	--	--	--	--	C4	39
N607401	--	--	C5	20	--	--
N607501	--	--	C5	21	--	--
N607601	--	--	C5	22	--	--
N607602	--	--	C5	23	--	--
N607603	--	--	C5	24	--	--
N607701	--	--	--	--	C5	35
N607702	--	--	--	--	C5	36
N607703	--	--	--	--	C5	37
N607801	--	--	--	--	C5	38
N607901	--	--	C6	23	--	--

Table A.16
(continued)

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
N608001	--	--	C6	24	--	--
N608002	--	--	C6	25	--	--
N608101	--	--	C6	26	--	--
N608103	--	--	C6	28	--	--
N608201	--	--	--	--	C6	28
N608301	--	--	--	--	C6	29
N608302	--	--	--	--	C6	30
N608303	--	--	--	--	C6	31
N608401	--	--	--	--	C6	32
N608402	--	--	--	--	C6	32
N608501	C1	37	C1	38	--	--
N608601	C1	38	C1	39	--	--
N608701	C1	39	C1	40	--	--
N608702	C1	40	C1	41	--	--
N608801	--	--	C1	42	--	--
N608901	C2	31	C2	32	--	--
N609001	C2	32	C2	33	--	--
N609101	C2	33	C2	34	--	--
N609201	C2	34	C2	35	--	--
N609202	C2	34	C2	35	--	--
N609301	C3	29	--	--	--	--
N609401	C3	30	--	--	--	--
N609501	C3	31	--	--	--	--
N609601	C3	32	--	--	--	--
N609602	C3	33	--	--	--	--
N609603	C3	33	--	--	--	--
N609701	--	--	C3	25	--	--
N609801	--	--	C3	26	--	--
N609901	--	--	C3	27	--	--
N610001	--	--	C3	28	--	--
N610101	--	--	C4	32	--	--
N610102	--	--	C4	33	--	--
N610103	--	--	C4	34	--	--
N610201	--	--	C4	35	--	--
N610301	--	--	C4	36	--	--
N610401	--	--	C4	37	--	--
N610501	--	--	C5	25	--	--
N610601	--	--	C5	26	--	--
N610701	--	--	C5	27	--	--
N610702	--	--	C5	28	--	--
N610703	--	--	C5	29	--	--
N610704	--	--	C5	30	--	--
N610801	--	--	C6	29	--	--
N610802	--	--	C6	30	--	--
N610803	--	--	C6	31	--	--
N610901	--	--	C6	32	--	--
N611001	--	--	C6	33	--	--
N611101	--	--	--	--	C1	38
N611103	--	--	--	--	C1	40
N611201	--	--	--	--	C1	41
N611202	--	--	--	--	C1	42
N611203	--	--	--	--	C1	43
N611204	--	--	--	--	C1	44
N611301	--	--	--	--	C2	33
N611302	--	--	--	--	C2	34
N611303	--	--	--	--	C2	35
N611304	--	--	--	--	C2	36
N611401	--	--	--	--	C3	25
N611402	--	--	--	--	C3	26
N611403	--	--	--	--	C3	27
N611404	--	--	--	--	C3	28
N611501	--	--	--	--	C4	40
N611601	--	--	--	--	C5	39
N611602	--	--	--	--	C5	40
N611603	--	--	--	--	C5	41
N611604	--	--	--	--	C5	42
N611605	--	--	--	--	C5	43
N611606	--	--	--	--	C5	44
N611701	--	--	--	--	C6	33
N611702	--	--	--	--	C6	34
N611703	--	--	--	--	C6	35
N611801	--	--	--	--	C6	36

BEST COPY AVAILABLE

Table A.17
U.S. HISTORY COGNITIVE ITEMS

FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
H000101	--	--	--	--	H1	13
H000201	--	--	--	--	H1	14
H000301	--	--	--	--	H1	15
H000401	--	--	--	--	H1	16
H000501	--	--	--	--	H1	17
H000601	--	--	--	--	H1	18
H000701	--	--	--	--	H1	19
H000801	--	--	--	--	H1	20
H000901	--	--	--	--	H1	21
H001001	--	--	--	--	H1	22
H001101	--	--	--	--	H1	23
H001201	--	--	--	--	H1	24
H001202	--	--	--	--	H1	25
H001203	--	--	--	--	H1	26
H001204	--	--	--	--	H1	27
H001205	--	--	--	--	H1	28
H001301	--	--	--	--	H1	29
H001401	--	--	--	--	H1	30
H001501	--	--	--	--	H1	31
H001601	--	--	--	--	H1	32
H001701	--	--	--	--	H1	33
H001801	--	--	--	--	H1	34
H001901	--	--	--	--	H1	35
H002001	--	--	--	--	H1	36
H002101	--	--	--	--	H1	37
H002201	--	--	--	--	H1	38
H002301	--	--	--	--	H1	39
H002401	--	--	--	--	H1	40
H002402	--	--	--	--	H1	41
H002403	--	--	--	--	H1	42
H002404	--	--	--	--	H1	43
H002405	--	--	--	--	H2	20
H002406	--	--	--	--	H2	21
H002407	--	--	--	--	H2	22
H002408	--	--	--	--	H2	23
H002501	--	--	--	--	H1	44
H002601	--	--	--	--	H1	45
H002701	--	--	--	--	H1	46
H002801	--	--	--	--	H1	47
H002901	--	--	--	--	H1	48
H003001	--	--	--	--	H2	13
H003101	--	--	--	--	H2	14
H003201	--	--	--	--	H2	15
H003301	--	--	--	--	H2	16
H003401	--	--	--	--	H2	17
H003501	--	--	--	--	H2	18
H003601	--	--	--	--	H2	19
H003701	--	--	--	--	H2	24
H003801	--	--	--	--	H2	25
H003901	--	--	--	--	H2	26
H004001	--	--	--	--	H2	27
H004101	--	--	--	--	H2	28
H004201	--	--	--	--	H2	29
H004301	--	--	--	--	H2	30
H004401	--	--	--	--	H2	31
H004501	--	--	--	--	H2	32
H004502	--	--	--	--	H2	33
H004601	--	--	--	--	H2	34
H004701	--	--	--	--	H2	35
H004801	--	--	--	--	H2	36
H004901	--	--	--	--	H2	37
H005001	--	--	--	--	H2	38
H005004	--	--	--	--	H4	17
H005005	--	--	--	--	H4	18
H005006	--	--	--	--	H4	19
H005007	--	--	--	--	H4	20
H005008	--	--	--	--	H4	21
H005009	--	--	--	--	H4	22
H005010	--	--	--	--	H4	23
H005101	--	--	--	--	H2	39
H005102	--	--	--	--	H2	40
H005103	--	--	--	--	H2	41
H005201	--	--	--	--	H2	42
H005301	--	--	--	--	H2	43
H005401	--	--	--	--	H2	44
H005501	--	--	--	--	H2	45
H005601	--	--	--	--	H2	46
H005701	--	--	--	--	H2	47
H005801	--	--	--	--	H2	48
H005901	--	--	--	--	H3	13
H006001	--	--	--	--	H3	14
H006101	--	--	--	--	H3	15
H006201	--	--	--	--	H3	16
H006301	--	--	--	--	H3	17
H006401	--	--	--	--	H3	18
H006501	--	--	--	--	H3	19
H006601	--	--	--	--	H3	20
H006701	--	--	--	--	H3	21
H006801	--	--	--	--	H3	22
H006901	--	--	--	--	H3	23
H007001	--	--	--	--	H3	24
H007101	--	--	--	--	H3	25
H007102	--	--	--	--	H3	26
H007103	--	--	--	--	H3	27
H007201	--	--	--	--	H3	28
H007301	--	--	--	--	H3	29
H007401	--	--	--	--	H3	30
H007501	--	--	--	--	H3	31
H007601	--	--	--	--	H3	32
H007701	--	--	--	--	H3	33
H007801	--	--	--	--	H3	34
H007901	--	--	--	--	H3	35
H008001	--	--	--	--	H3	36
H008101	--	--	--	--	H3	37
H008201	--	--	--	--	H3	38
H008301	--	--	--	--	H3	39
H008302	--	--	--	--	H3	40
H008303	--	--	--	--	H3	41
H008304	--	--	--	--	H3	42
H008305	--	--	--	--	H3	43
H008401	--	--	--	--	H3	44
H008501	--	--	--	--	H3	45
H008601	--	--	--	--	H3	46
H008701	--	--	--	--	H3	47
H008801	--	--	--	--	H4	13
H008901	--	--	--	--	H4	14
H009001	--	--	--	--	H4	15
H009101	--	--	--	--	H4	16
H009201	--	--	--	--	H4	24
H009301	--	--	--	--	H4	25
H009401	--	--	--	--	H4	26
H009501	--	--	--	--	H4	27
H009601	--	--	--	--	H4	28
H009701	--	--	--	--	H4	29
H009801	--	--	--	--	H4	30
H009901	--	--	--	--	H4	31
H010001	--	--	--	--	H4	32
H010101	--	--	--	--	H4	33
H010201	--	--	--	--	H4	34
H010301	--	--	--	--	H4	35
H010401	--	--	--	--	H4	36
H010501	--	--	--	--	H4	37
H010601	--	--	--	--	H4	38
H010701	--	--	--	--	H4	39
H010801	--	--	--	--	H4	40
H010901	--	--	--	--	H4	41
H011001	--	--	--	--	H4	42
H011101	--	--	--	--	H4	43
H011201	--	--	--	--	H4	44
H011301	--	--	--	--	H4	45
H011401	--	--	--	--	H4	46

BEST COPY AVAILABLE

Table A.18
LITERATURE COGNITIVE ITEMS

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
L000101	--	--	--	--	L1	19
L000201	--	--	--	--	L1	20
L000301	--	--	--	--	L1	21
L000401	--	--	--	--	L1	22
L000501	--	--	--	--	L1	23
L000601	--	--	--	--	L1	24
L000701	--	--	--	--	L1	25
L000801	--	--	--	--	L1	26
L000901	--	--	--	--	L1	27
L001001	--	--	--	--	L1	28
L001101	--	--	--	--	L1	29
L001201	--	--	--	--	L1	30
L001301	--	--	--	--	L1	31
L001401	--	--	--	--	L1	32
L001501	--	--	--	--	L1	33
L001601	--	--	--	--	L1	34
L001701	--	--	--	--	L1	35
L001801	--	--	--	--	L1	36
L001901	--	--	--	--	L1	37
L002001	--	--	--	--	L1	38
L002101	--	--	--	--	L1	39
L002201	--	--	--	--	L1	40
L002301	--	--	--	--	L1	41
L002401	--	--	--	--	L1	42
L002501	--	--	--	--	L1	43
L002601	--	--	--	--	L1	44
L002701	--	--	--	--	L1	45
L002801	--	--	--	--	L1	46
L002901	--	--	--	--	L1	47
L003001	--	--	--	--	L1	48
L003101	--	--	--	--	L2	19
L003201	--	--	--	--	L2	20
L003301	--	--	--	--	L2	21
L003401	--	--	--	--	L2	22
L003501	--	--	--	--	L2	23
L003601	--	--	--	--	L2	24
L003701	--	--	--	--	L2	25
L003801	--	--	--	--	L2	26
L003901	--	--	--	--	L2	27
L004001	--	--	--	--	L2	28
L004101	--	--	--	--	L2	29
L004201	--	--	--	--	L2	30
L004301	--	--	--	--	L2	31
L004401	--	--	--	--	L2	32
L004501	--	--	--	--	L2	33
L004601	--	--	--	--	L2	34
L004701	--	--	--	--	L2	35
L004801	--	--	--	--	L2	36
L004901	--	--	--	--	L2	37
L005001	--	--	--	--	L2	38
L005101	--	--	--	--	L2	39
L005201	--	--	--	--	L2	40
L005301	--	--	--	--	L2	41
L005401	--	--	--	--	L2	42
L005501	--	--	--	--	L2	43
L005601	--	--	--	--	L2	44
L005701	--	--	--	--	L2	45
L005801	--	--	--	--	L2	46
L005901	--	--	--	--	L2	47
L006001	--	--	--	--	L2	48
L006101	--	--	--	--	L2	49
L006201	--	--	--	--	L3	19
L006301	--	--	--	--	L3	20
L006401	--	--	--	--	L3	21
L006501	--	--	--	--	L3	22
L006601	--	--	--	--	L3	23
L006701	--	--	--	--	L3	24
L006801	--	--	--	--	L3	25
L006901	--	--	--	--	L3	26
L007001	--	--	--	--	L3	27
L007101	--	--	--	--	L3	28
L007201	--	--	--	--	L3	29
L007301	--	--	--	--	L3	30
L007401	--	--	--	--	L3	31
L007501	--	--	--	--	L3	32
L007601	--	--	--	--	L3	33
L007701	--	--	--	--	L3	34
L007801	--	--	--	--	L3	35
L007901	--	--	--	--	L3	36
L008001	--	--	--	--	L3	37
L008101	--	--	--	--	L3	38
L008201	--	--	--	--	L3	39
L008301	--	--	--	--	L3	40
L008401	--	--	--	--	L3	41
L008501	--	--	--	--	L3	42
L008601	--	--	--	--	L3	43
L008701	--	--	--	--	L3	44
L008801	--	--	--	--	L3	45
L008901	--	--	--	--	L3	46
L009001	--	--	--	--	L3	47
L009101	--	--	--	--	L3	48
L009201	--	--	--	--	L4	19
L009301	--	--	--	--	L4	20
L009401	--	--	--	--	L4	21
L009501	--	--	--	--	L4	22
L009601	--	--	--	--	L4	23
L009701	--	--	--	--	L4	24
L009801	--	--	--	--	L4	25
L009901	--	--	--	--	L4	26
L010001	--	--	--	--	L4	27
L010101	--	--	--	--	L4	28
L010201	--	--	--	--	L4	29
L010301	--	--	--	--	L4	30
L010401	--	--	--	--	L4	31
L010501	--	--	--	--	L4	32
L010601	--	--	--	--	L4	33
L010701	--	--	--	--	L4	34
L010801	--	--	--	--	L4	35
L010901	--	--	--	--	L4	36
L011001	--	--	--	--	L4	37
L011101	--	--	--	--	L4	38
L011201	--	--	--	--	L4	39
L011301	--	--	--	--	L4	40
L011401	--	--	--	--	L4	41
L011501	--	--	--	--	L4	42
L011601	--	--	--	--	L4	43
L011701	--	--	--	--	L4	44
L011801	--	--	--	--	L4	45
L011901	--	--	--	--	L4	46
L012001	--	--	--	--	L4	47
L012101	--	--	--	--	L4	48

Table A.19
COMMON BACKGROUND ITEMS

FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
B000901	B1	7	B1	7	B1	7
B000902	B1	8	B1	8	B1	8
B000903	B1	9	B1	9	B1	9
B000904	B1	10	B1	10	B1	10
B000905	B1	11	B1	11	B1	11
B001801	B1	12	B1	12	B1	12
B003001	B1	1	B1	1	B1	1
B003101	B1	2	B1	2	B1	2
B003201	B1	3	--	--	--	--
B003301	--	--	B1	3	B1	3
B003401	B1	4	B1	4	B1	4
B003501	B1	5	B1	5	B1	5
B003601	B1	6	B1	6	B1	6
B003701	B1	13	B1	13	B1	13
B003801	B1	14	--	--	--	--
B003901	--	--	B1	14	B1	14
B004001	B1	15	B1	15	B1	15
B004101	B1	16	--	--	--	--
B004201	B1	18	B1	17	B1	17
B004301	B1	19	B1	18	B1	18
B004401	B1	20	B1	19	B1	19
B004501	B1	21	B1	20	--	--
B004601	B1	22	B1	21	--	--
B004701	B1	23	--	--	--	--
B004801	--	--	B1	22	--	--
B004901	--	--	B1	23	--	--
B005001	--	--	--	--	B1	20
B005101	--	--	--	--	B1	21
B005201	--	--	--	--	B1	22
B005202	--	--	--	--	B1	23
B005203	--	--	--	--	B1	24
B005204	--	--	--	--	B1	25
B005301	--	--	--	--	B1	26
B005302	--	--	--	--	B1	27
B005303	--	--	--	--	B1	28
B005304	--	--	--	--	B1	29
B005305	--	--	--	--	B1	30
B005306	--	--	--	--	B1	31
B005307	--	--	--	--	B1	32
B005308	--	--	--	--	B1	33
B005309	--	--	--	--	B1	34
B005310	--	--	--	--	B1	35
B005311	--	--	--	--	B1	36
B005312	--	--	--	--	B1	37
B005313	--	--	--	--	B1	38
B005401	--	--	B1	24	B1	39
B005501	--	--	--	--	B1	42
B005601	B1	24	B1	26	B1	43
B005701	B1	25	B1	27	B1	44
B005801	B1	26	B1	28	B1	45
B005901	B1	27	--	--	--	--
B006001	--	--	B1	29	B1	46
B006101	B1	28	--	--	--	--
B006201	--	--	B1	30	B1	47
B006301	--	--	--	--	B1	48
B006302	--	--	--	--	B1	48
B006501	--	--	--	--	B1	41

Table A.20
READING BACKGROUND ITEMS

FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
S001001	R2	7	R2	7	R2	7
S001002	R2	8	R2	8	R2	8
S001003	R2	9	R2	9	R2	9
S002701	B1	17	B1	16	B1	16
S003301	R3	1	R1	19	R1	19
S003501	R3	2	--	--	--	--
S003502	R3	3	--	--	--	--
S003503	R3	4	--	--	--	--
S003504	R3	5	--	--	--	--
S003505	R3	6	--	--	--	--
S003506	R3	7	--	--	--	--
S004001	--	--	B1	25	B1	40
S004301	--	--	R3	1	R3	1
S004302	--	--	R3	2	R3	2
S004303	--	--	R3	3	R3	3
S004304	--	--	R3	4	R3	4
S004305	--	--	R3	5	R3	5
S004306	--	--	R3	6	R3	6
S004307	--	--	R3	7	R3	7
S004308	--	--	R3	8	R3	8
S004309	--	--	R3	9	R3	9
S004310	--	--	R3	10	R3	10
S004311	--	--	R3	11	R3	11
S004401	R1	10	--	--	--	--
S004402	R1	11	--	--	--	--
S004501	--	--	R3	12	R3	12
S004502	--	--	R3	13	R3	13
S004503	--	--	R3	14	R3	14
S004504	--	--	R3	15	R3	15
S004601	R2	1	R2	1	R2	1
S004602	R2	2	R2	2	R2	2
S004603	R2	3	R2	3	R2	3
S004701	R2	4	R2	4	R2	4
	--	--	R4	1	R4	1
S004702	R2	5	R2	5	R2	5
	--	--	R4	2	R4	2
S004703	R2	6	R2	6	R2	6
S004704	--	--	R4	3	R4	3
S004705	--	--	R4	4	R4	4
S004706	--	--	R4	5	R4	5
S004707	--	--	R4	6	R4	6
S004708	--	--	R4	7	R4	7
S005101	R1	1	R1	1	R1	1
S005102	R1	2	R1	2	R1	2
S005103	R1	3	R1	3	R1	3
S005104	R1	4	R1	4	R1	4
S005105	R1	5	R1	5	R1	5
S005106	R1	6	R1	6	R1	6
S005201	R1	7	R1	7	R1	7
S005202	R1	8	R1	8	R1	8
S005203	R1	9	R1	9	R1	9
S005301	--	--	R1	10	R1	10
S005302	--	--	R1	11	R1	11
S005303	--	--	R1	12	R1	12
S005304	--	--	R1	13	R1	13
S005305	--	--	R1	14	R1	14
S005401	--	--	R1	15	R1	15
S005402	--	--	R1	16	R1	16
S005403	--	--	R1	17	R1	17
S005404	--	--	R1	18	R1	18
S006901	R4	4	R6	4	R6	4
S007001	R4	3	R6	3	R6	3
S007002	R4	3	R6	3	R6	3
S007003	R4	3	R6	3	R6	3
S007004	R4	3	R6	3	R6	3
S007005	R4	3	R6	3	R6	3
S007006	R4	3	R6	3	R6	3
S007007	R4	3	R6	3	R6	3
S007008	R4	3	R6	3	R6	3
S007009	R4	3	R6	3	R6	3
S007010	R4	3	R6	3	R6	3
S007201	R4	1	R6	1	R6	1
S007202	R4	2	R6	2	R6	2
S007301	R5	1	--	--	--	--
S007302	R5	2	--	--	--	--
S007303	R5	3	--	--	--	--
S007304	R5	4	--	--	--	--
S007305	R5	5	--	--	--	--
S007306	R5	6	--	--	--	--
S007307	R5	7	--	--	--	--
S007308	R5	8	--	--	--	--
S007309	R5	9	--	--	--	--
S007310	R5	10	--	--	--	--
S007401	R6	1	--	--	--	--
S007402	R6	2	--	--	--	--
S007403	R6	3	--	--	--	--
S007404	R6	4	--	--	--	--
S007901	--	--	R5	1	R5	1
S008001	--	--	R5	2	R5	2
S008101	--	--	R5	3	R5	3
S008201	--	--	R5	4	R5	4
S008301	--	--	R5	5	R5	5
S008401	--	--	R5	6	R5	6

Table A.21
MATHEMATICS BACKGROUND ITEMS

FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
S200901	M3	1	--	--	--	--
S200902	M3	2	--	--	--	--
S200903	M3	3	--	--	--	--
S201601	--	--	M1	1	M1	1
S201602	--	--	M1	2	M1	2
S201603	--	--	M1	3	M1	3
S201604	--	--	M1	4	M1	4
S201605	--	--	M1	5	M1	5
S201606	--	--	M1	6	M1	6
S201607	--	--	M1	7	M1	7
S201608	--	--	M1	8	M1	8
S201609	--	--	M1	9	M1	9
S201610	--	--	M1	10	M1	10
S201611	--	--	M1	11	M1	11
S201612	--	--	M1	12	M1	12
S201613	--	--	M1	13	M1	13
S201614	--	--	M1	14	M1	14
S202201	--	--	M2	1	--	--
S202202	--	--	M2	2	--	--
S202203	--	--	M2	3	--	--
S202204	--	--	M2	4	--	--
S202205	--	--	M2	5	--	--
S202206	--	--	M2	6	--	--
S202207	--	--	M2	7	--	--
S202901	--	--	M3	1	M3	1
S202902	--	--	M3	2	M3	2
S202903	--	--	M3	3	M3	3
S202904	--	--	M3	4	M3	4
S202905	--	--	M3	5	M3	5
S202906	--	--	M3	6	M3	6
S202907	--	--	M3	7	M3	7
S202908	--	--	M3	8	M3	8
S202909	--	--	--	--	M3	9
S202910	--	--	--	--	M3	10
S202911	--	--	--	--	M3	11
S203701	--	--	--	--	M2	1
S203702	--	--	--	--	M2	2
S203703	--	--	--	--	M2	3
S203704	--	--	--	--	M2	4
S203705	--	--	--	--	M2	5
S203706	--	--	--	--	M2	6
S203707	--	--	--	--	M2	7
S203708	--	--	--	--	M2	8
S203709	--	--	--	--	M2	9
S203710	--	--	--	--	M2	10
S203711	--	--	--	--	M2	11
S203712	--	--	--	--	M2	12
S203713	--	--	--	--	M2	13
S203714	--	--	--	--	M2	14
S205401	--	--	M4	1	M4	1
S205402	--	--	M4	2	M4	2
S205403	--	--	M4	3	M4	3
S205404	--	--	M4	4	M4	4
S205405	--	--	M4	5	M4	5
S205406	--	--	M4	6	M4	6
S205501	M4	1	M4	7	M4	7
S205502	M4	2	M4	8	M4	8
S205503	M4	3	M4	9	M4	9
S205504	M4	4	M4	10	M4	10
S205601	M4	5	--	--	--	--
S205701	M4	6	--	--	--	--
S205801	M4	7	M5	15	M5	15
S205901	M5	1	--	--	--	--
S205902	M5	2	--	--	--	--
S205903	M5	3	--	--	--	--
S205904	M5	4	--	--	--	--
S205905	M5	5	--	--	--	--
S205906	M5	6	--	--	--	--
S206001	--	--	M5	16	M5	16
S206101	M5	7	M5	1	M5	1
S206102	M5	8	M5	2	M5	2
S206103	M5	9	M5	3	M5	3
S206104	M5	10	M5	4	M5	4
S206601	--	--	M4	11	M4	11
S206701	M7	1	--	--	--	--
S206702	M7	2	--	--	--	--
S206703	M7	3	--	--	--	--
S206704	M7	4	--	--	--	--
S206705	M7	5	--	--	--	--
S206706	M7	6	--	--	--	--
S207101	M7	7	--	--	--	--
S207102	M7	8	--	--	--	--
S207103	M7	9	--	--	--	--
S207104	M7	10	--	--	--	--
S207201	M5	11	--	--	--	--
S207501	--	--	M6	1	M6	1
S207502	--	--	M6	2	M6	2
S207503	--	--	M6	3	M6	3
S207504	--	--	M6	4	M6	4
S207505	--	--	M6	5	M6	5
S207506	--	--	M6	6	M6	6
S207507	--	--	M6	7	M6	7
S207508	--	--	M6	8	M6	8
S207509	--	--	M6	9	M6	9
S207510	--	--	M6	10	M6	10
S207511	--	--	M6	11	--	--
S207512	--	--	M6	12	--	--
S207601	M6	1	--	--	--	--
S207602	M6	2	--	--	--	--
S207603	M6	3	--	--	--	--
S207604	M6	4	--	--	--	--
S207605	M6	5	--	--	--	--
S207606	M6	6	--	--	--	--
S207607	M6	7	--	--	--	--
S207608	M6	8	--	--	--	--
S208501	--	--	M4	12	M4	12
S208601	--	--	M4	13	M4	13
S208701	--	--	M4	14	M4	14
S208801	--	--	M5	5	M5	5
S208802	--	--	M5	6	M5	6
S208803	--	--	M5	7	M5	7
S208804	--	--	M5	8	M5	8
S208805	--	--	M5	9	M5	9
S208806	--	--	M5	10	M5	10
S208901	--	--	M5	11	M9	17
	--	--	--	--	M5	11
S208902	--	--	M5	12	M9	18
	--	--	--	--	M5	12
S208903	--	--	M5	13	M9	19
	--	--	--	--	M5	13
S208904	--	--	M5	14	M9	20
	--	--	--	--	M5	14
S209001	--	--	M5	17	M5	17
S209501	--	--	M7	1	M7	1
S209502	--	--	M7	2	M7	2
S209503	--	--	M7	3	M7	3
S209504	--	--	M7	4	M7	4
S209505	--	--	M7	5	M7	5
S209506	--	--	M7	6	M7	6
S209507	--	--	M7	7	M7	7
S209508	--	--	M7	8	M7	8
S209509	--	--	M7	9	M7	9
S209510	--	--	M7	10	M7	10
S209511	--	--	M7	11	M7	11
S209512	--	--	M7	12	M7	12
S209513	--	--	M7	13	M7	13
S209514	--	--	M7	14	M7	14
S209515	--	--	M7	15	M7	15
S209516	--	--	M7	16	M7	16
S211001	--	--	M8	1	M8	1
S211002	--	--	M8	2	M8	2
S211003	--	--	M8	3	M8	3
S211004	--	--	M8	4	M8	4
S211005	--	--	M8	5	M8	5
S211006	--	--	M8	6	M8	6
S211007	--	--	M8	7	M8	7

Table A.21
(continued)

FIELD	COHORT 1 BLOCK	COHORT 1 ITEM	COHORT 2 BLOCK	COHORT 2 ITEM	COHORT 3 BLOCK	COHORT 3 ITEM
S211008	--	--	M8	8	M8	8
S211009	--	--	M8	9	M8	9
S211010	--	--	M8	10	M8	10
S211011	--	--	M8	11	M8	11
S211012	--	--	M8	12	M8	12
S211013	--	--	M8	13	M8	13
S211014	--	--	M8	14	M8	14
S211015	--	--	M8	15	M8	15
S211301	--	--	M9	1	--	--
S211302	--	--	M9	2	--	--
S211303	--	--	M9	3	--	--
S211304	--	--	M9	4	--	--
S211305	--	--	M9	5	--	--
S211306	--	--	M9	6	--	--
S211307	--	--	M9	7	--	--
S211308	--	--	M9	8	--	--
S211401	--	--	M9	9	M1	3
S211402	--	--	M9	10	M1	4
S211403	--	--	M9	11	M1	5
S211404	--	--	M9	12	M1	6
S211405	--	--	M9	13	M1	7
S211406	--	--	M9	14	M1	8
S211407	--	--	M9	15	M1	9
S211408	--	--	M9	16	M1	10
S211409	--	--	--	--	M1	1
S211410	--	--	--	--	M1	2
S211501	--	--	--	--	M1	1
S211502	--	--	--	--	M1	2
S211503	--	--	--	--	M1	3
S211504	--	--	--	--	M1	4
S211505	--	--	--	--	M1	5
S211506	--	--	--	--	M1	6
S211507	--	--	--	--	M1	7
S211508	--	--	--	--	M1	8
S211509	--	--	--	--	M1	9
S211510	--	--	--	--	M1	10
S211511	--	--	--	--	M1	11
S212001	--	--	--	--	M9	1
S212002	--	--	--	--	M9	2
S212003	--	--	--	--	M9	3
S212004	--	--	--	--	M9	4
S212005	--	--	--	--	M9	5
S212006	--	--	--	--	M9	6
S212007	--	--	--	--	M9	7
S212008	--	--	--	--	M9	8
S212009	--	--	--	--	M9	9
S212010	--	--	--	--	M9	10
S212011	--	--	--	--	M9	11
S212101	--	--	--	--	M9	12
S212102	--	--	--	--	M9	13
S212103	--	--	--	--	M9	14
S212104	--	--	--	--	M9	15
S212105	--	--	--	--	M9	16

Table A.22
SCIENCE BACKGROUND ITEMS

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
S400101	S3	1	--	--	--	--
S400102	S3	2	--	--	--	--
S400103	S3	3	--	--	--	--
S400104	S3	4	--	--	--	--
S400105	S3	5	--	--	--	--
S400106	S3	6	--	--	--	--
S400107	S3	7	--	--	--	--
S400108	S3	8	--	--	--	--
S400109	S3	9	--	--	--	--
S400110	S3	10	--	--	--	--
S400111	S3	11	--	--	--	--
S400301	S1	1	--	--	--	--
S400302	S1	2	--	--	--	--
S400303	S1	3	--	--	--	--
S400304	S1	4	--	--	--	--
S400305	S1	5	--	--	--	--
S400701	--	--	S2	1	S2	1
S400702	--	--	S2	2	S2	2
S400703	--	--	S2	3	S2	3
S400801	--	--	S2	4	S2	4
S400802	--	--	S2	5	S2	5
S400803	--	--	S2	6	S2	6
S400804	--	--	S2	7	S2	7
S400805	--	--	S2	8	S2	8
S400806	--	--	S2	9	S2	9
S400901	--	--	S1	1	S1	1
S400902	--	--	S1	2	S1	2
S401201	--	--	S1	3	S1	3
S401202	--	--	S1	4	S1	4
S401203	--	--	S1	5	S1	5
S401204	--	--	S1	6	S1	6
S401205	--	--	S1	7	S1	7
S401206	--	--	S1	8	S1	8
S401207	--	--	S1	9	S1	9
S401208	--	--	S1	10	S1	10
S401209	--	--	S1	11	S1	11
S401301	--	--	S3	1	S3	1
S401302	--	--	S3	2	S3	2
S401303	--	--	S3	3	S3	3
S401304	--	--	S3	4	S3	4
S401305	--	--	S3	5	S3	5
S401401	--	--	S3	6	S3	6
S401402	--	--	S3	7	S3	7
S401403	--	--	S3	8	S3	8
S401404	--	--	S3	9	S3	9
S401501	S5	1	--	--	--	--
S401601	S4	2	S4	2	S4	3
S401602	S4	3	S4	3	S4	4
S401603	S4	4	S4	4	S4	5
S401604	S4	5	S4	5	S4	6
S401605	S4	6	S4	6	S4	7
S401606	S4	7	S4	7	S4	8
S401607	S4	8	S4	8	S4	9
S401608	S4	9	S4	9	S4	10
S401701	--	--	S6	1	S6	1
S401801	S5	2	S5	1	S5	1
S401901	--	--	--	--	S7	1
S401902	--	--	--	--	S7	2
S401903	--	--	--	--	S7	3
S401904	--	--	--	--	S7	4
S401905	--	--	--	--	S7	5
S401906	--	--	--	--	S7	6
S401907	--	--	--	--	S7	7
S401908	--	--	--	--	S7	8
S401909	--	--	--	--	S7	9
S401910	--	--	--	--	S7	10
S401911	--	--	--	--	S7	11
S401912	--	--	--	--	S7	12
S402001	--	--	S9	1	S8	1
S402002	--	--	S9	2	S8	2
S402003	--	--	S9	3	S8	3
S402004	--	--	S9	4	S8	4
S402005	--	--	S9	5	S8	5
S402101	S4	1	S4	1	S4	1
S402201	--	--	S7	2	S1	1
S402202	--	--	S7	3	S1	2
S402203	--	--	S7	4	S1	3
S402204	--	--	S7	5	S1	4
S402301	--	--	S6	2	S6	2
S402302	--	--	S6	3	S6	3
S402303	--	--	S6	4	S6	4
S402304	--	--	S6	5	S6	5
S402305	--	--	S6	6	S6	6
S402306	--	--	S6	7	S6	7
S402307	--	--	S6	8	S6	8
S402308	--	--	S6	9	S6	9
S402309	--	--	S6	10	S6	10
S402401	--	--	S7	1	S4	11
S402501	--	--	S7	6	S1	12
S402502	--	--	S7	7	S1	13
S402503	--	--	S7	8	S1	14
S402504	--	--	S7	9	S1	15
S402601	--	--	S8	1	S4	2
S402701	--	--	S8	2	S1	5
S402702	--	--	S8	3	S1	6
S402703	--	--	S8	4	S1	7
S402704	--	--	S8	5	S1	8
S402705	--	--	S8	6	S1	9
S402801	--	--	S8	7	S9	10
S402802	--	--	S8	8	S9	11
S402803	--	--	S8	9	S9	12
S402804	--	--	S8	10	S9	13
S402805	--	--	S8	11	S9	14
S402806	--	--	S8	12	S9	15
S402807	--	--	S8	13	S9	16
S402808	--	--	S8	14	S9	17
S402901	--	--	--	--	S9	1
S402902	--	--	--	--	S9	2
S402903	--	--	--	--	S9	3
S402904	--	--	--	--	S9	4
S402905	--	--	--	--	S9	5
S402906	--	--	--	--	S9	6
S402907	--	--	--	--	S9	7
S402908	--	--	--	--	S9	8
S402909	--	--	--	--	S9	9
S403101	--	--	S9	6	S8	6
S403102	--	--	S9	7	S8	7
S403103	--	--	S9	8	S8	8
S403104	--	--	S9	9	S8	9
S403105	--	--	S9	10	S8	10
S403106	--	--	S9	11	S8	11
S403107	--	--	S9	12	S8	12
S403108	--	--	S9	13	S8	13
S403201	S6	1	--	--	--	--
S403301	--	--	--	--	S1	1
S403302	--	--	--	--	S1	2
S403303	--	--	--	--	S1	3
S403304	--	--	--	--	S1	4
S403305	--	--	--	--	S1	5
S403306	--	--	--	--	S1	6
S403307	--	--	--	--	S1	7
S403308	--	--	--	--	S1	8
S403309	--	--	--	--	S1	9
S403310	--	--	--	--	S1	10
S403401	--	--	--	--	S1	11
S403501	--	--	--	--	S7	13
S403502	--	--	--	--	S7	14
S403503	--	--	--	--	S7	15
S403504	--	--	--	--	S7	16
S403505	--	--	--	--	S7	17
S403601	S5	3	--	--	--	--
S403701	S5	4	--	--	--	--
S403801	S6	2	--	--	--	--
S403901	S6	3	--	--	--	--
S404001	S6	4	--	--	--	--
S404101	S7	1	--	--	--	--

Table A.22
(continued)

FIELD	COHORT 1 BLOCK	COHORT 1 ITEM	COHORT 2 BLOCK	COHORT 2 ITEM	COHORT 3 BLOCK	COHORT 3 ITEM
S404102	S7	2	--	--	--	--
S404103	S7	3	--	--	--	--
S404104	S7	4	--	--	--	--
S404105	S7	5	--	--	--	--
S404201	S7	6	--	--	--	--
S404301	S7	7	--	--	--	--

Table A.23
COMPUTER COMPETENCE BACKGROUND ITEMS

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
S600101	C1	1	C1	1	C1	1
S600102	C1	2	C1	2	C1	2
S600103	C1	3	C1	3	C1	3
S600104	C1	4	C1	4	C1	4
S600105	C1	5	C1	5	C1	5
S600106	C1	6	C1	6	C1	6
S600201	C1	7	C1	7	C1	7
	C2	10	C2	10	C2	10
S600301	C1	8	C1	8	C1	8
	C2	11	C2	11	C2	11
S600302	C1	8	C1	8	C1	8
	C2	11	C2	11	C2	11
S600303	C1	8	C1	8	C1	8
	C2	11	C2	11	C2	11
S600304	C1	8	C1	8	C1	8
	C2	11	C2	11	C2	11
S600401	C1	9	C1	9	C1	9
S600501	C1	10	--	--	--	--
S600502	C1	11	--	--	--	--
S600503	C1	12	--	--	--	--
S600504	C1	13	--	--	--	--
S600505	C1	14	--	--	--	--
S600506	C1	15	--	--	--	--
S600507	C1	16	--	--	--	--
S600508	C1	17	--	--	--	--
S600509	C1	18	--	--	--	--
S600601	C1	30	C1	31	C1	31
	C2	24	C2	25	C2	25
	C3	22	C3	18	C3	18
	--	--	C4	25	C4	31
	--	--	C5	18	C5	33
	--	--	C6	21	C6	26
S600602	C1	30	C1	31	C1	31
	C2	24	C2	25	C2	25
	C3	22	C3	18	C3	18
	--	--	C4	25	C4	31
	--	--	C5	18	C5	33
	--	--	C6	21	C6	26
S600603	C1	30	C1	31	C1	31
	C2	24	C2	25	C2	25
	C3	22	C3	18	C3	18
	--	--	C4	25	C4	31
	--	--	C5	18	C5	33
	--	--	C6	21	C6	26
S600604	C1	30	C1	31	C1	31
	C2	24	C2	25	C2	25
	C3	22	C3	18	C3	18
	--	--	C4	25	C4	31
	--	--	C5	18	C5	33
	--	--	C6	21	C6	26
S600605	C1	30	C1	31	C1	31
	C2	24	C2	25	C2	25
	C3	22	C3	18	C3	18
	--	--	C4	25	C4	31
	--	--	C5	18	C5	33
	--	--	C6	21	C6	26
S600606	C1	30	C1	31	C1	31
	C2	24	C2	25	C2	25
	C3	22	C3	18	C3	18
	--	--	C4	25	C4	31
	--	--	C5	18	C5	33
	--	--	C6	21	C6	26
S600701	C1	31	C1	32	C1	32
	C2	25	C2	26	C2	26
	C3	23	C3	19	C3	19
	--	--	C4	26	C4	32
	--	--	C5	19	C5	34
	--	--	C6	22	C6	27
S600801	--	--	C1	10	C1	10
	--	--	C5	1	C6	12
S600802	--	--	C1	11	C1	11
S600803	--	--	C1	12	C1	12

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
S600804	--	--	C1	13	C1	13
	--	--	C5	2	C6	13
S600805	--	--	C1	14	C1	14
S600806	--	--	C1	15	C1	15
	--	--	C5	4	--	--
S600807	--	--	C1	16	C1	16
	--	--	C5	5	C6	14
S600808	--	--	C1	17	C1	17
S600809	--	--	C1	18	C1	18
S600810	--	--	C1	19	C1	19
	--	--	C5	6	--	--
S600811	--	--	C5	3	--	--
S600812	--	--	--	--	C6	15
S600813	--	--	--	--	C6	16
S600901	C2	1	C2	1	C2	1
S600902	C2	2	C2	2	C2	2
S600903	C2	3	C2	3	C2	3
S600904	C2	4	C2	4	C2	4
S600905	C2	5	C2	5	C2	5
S600906	C2	6	C2	6	C2	6
S600907	C2	7	C2	7	C2	7
S600908	C2	8	C2	8	C2	8
S600909	C2	9	C2	9	C2	9
S601001	C2	12	C2	12	C2	12
S601101	C2	13	C2	13	C2	13
	C3	9	--	--	--	--
S601201	C3	1	C4	1	--	--
S601301	C3	2	C4	2	--	--
S601401	C3	3	--	--	--	--
S601501	C3	4	--	--	--	--
S601601	C3	5	--	--	--	--
S601701	C3	6	--	--	--	--
S601801	C3	7	--	--	--	--
S601901	C3	8	--	--	--	--
S602001	C3	10	C6	10	--	--
S602101	C3	11	C3	17	C3	17
	--	--	--	--	C5	16
S602201	--	--	C3	16	C3	16
S602301	--	--	C4	3	--	--
S602401	--	--	C4	4	--	--
S602501	--	--	C4	5	C4	21
S602601	--	--	C6	1	C4	1
S602701	--	--	C6	2	C4	2
S602801	--	--	C6	3	C4	3
S602901	--	--	C6	5	C4	4
S603001	--	--	C6	6	C4	5
S603101	--	--	C6	7	C4	6
S603201	--	--	--	--	C4	7
S603202	--	--	--	--	C4	8
S603203	--	--	--	--	C4	9
S603204	--	--	--	--	C4	10
S603205	--	--	--	--	C4	11
S603206	--	--	--	--	C4	12
S603207	--	--	--	--	C4	13
S603208	--	--	--	--	C4	14
S603209	--	--	--	--	C4	15
S603210	--	--	--	--	C4	16
S603211	--	--	--	--	C4	17
S603212	--	--	--	--	C4	18
S603213	--	--	--	--	C4	19
S603301	--	--	--	--	C4	20
S603401	--	--	C5	10	--	--
S603402	--	--	C5	10	--	--
S603403	--	--	C5	10	--	--
S603404	--	--	C5	10	--	--
S603501	--	--	C5	11	--	--
S603502	--	--	C5	11	--	--
S603503	--	--	C5	11	--	--
S603504	--	--	C5	11	--	--
S603601	--	--	--	--	C5	1
	--	--	--	--	C6	1
S603602	--	--	--	--	C5	2
	--	--	--	--	C6	2

Table A.23
(continued)

FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
S603603	--	--	--	--	C5	3
	--	--	--	--	C6	3
S603604	--	--	--	--	C5	4
	--	--	--	--	C6	4
S603701	--	--	--	--	C5	5
	--	--	--	--	C6	5
S603702	--	--	--	--	C5	6
	--	--	--	--	C6	6
S603703	--	--	--	--	C5	7
	--	--	--	--	C6	7
S603704	--	--	--	--	C5	8
	--	--	--	--	C6	8
S603801	--	--	--	--	C5	9
S603802	--	--	--	--	C5	10
S603803	--	--	--	--	C5	11
S603804	--	--	--	--	C5	12
S603805	--	--	--	--	C5	13
S603806	--	--	--	--	C5	14
S603807	--	--	--	--	C5	15
S603901	--	--	--	--	C5	17
S604101	--	--	C6	4	--	--
S604201	--	--	C6	8	--	--
S604301	--	--	C6	9	--	--
S604401	--	--	--	--	C6	9
S604402	--	--	--	--	C6	10
S604403	--	--	--	--	C6	11
S604501	--	--	--	--	C6	17
S604502	--	--	--	--	C6	17

Table A.24
U.S. HISTORY BACKGROUND ITEMS

	COHORT 1		COHORT 2		COHORT 3	
FIELD	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
H800101	--	--	--	--	H1	1
	--	--	--	--	H2	1
	--	--	--	--	H3	1
	--	--	--	--	H4	1
H800201	--	--	--	--	H1	2
	--	--	--	--	H2	2
	--	--	--	--	H3	2
	--	--	--	--	H4	2
H800202	--	--	--	--	H1	3
	--	--	--	--	H2	3
	--	--	--	--	H3	3
	--	--	--	--	H4	3
H800203	--	--	--	--	H1	4
	--	--	--	--	H2	4
	--	--	--	--	H3	4
	--	--	--	--	H4	4
H800204	--	--	--	--	H1	5
	--	--	--	--	H2	5
	--	--	--	--	H3	5
	--	--	--	--	H4	5
H800205	--	--	--	--	H1	6
	--	--	--	--	H2	6
	--	--	--	--	H4	6
H800301	--	--	--	--	H1	7
	--	--	--	--	H2	7
	--	--	--	--	H3	7
	--	--	--	--	H4	7
H800302	--	--	--	--	H1	8
	--	--	--	--	H2	8
	--	--	--	--	H3	8
	--	--	--	--	H4	8
H800303	--	--	--	--	H1	9
	--	--	--	--	H2	9
	--	--	--	--	H3	9
	--	--	--	--	H4	9
H800304	--	--	--	--	H1	10
	--	--	--	--	H2	10
	--	--	--	--	H3	10
	--	--	--	--	H4	10
H800305	--	--	--	--	H1	11
	--	--	--	--	H2	11
	--	--	--	--	H3	11
	--	--	--	--	H4	11
H800306	--	--	--	--	H1	12
	--	--	--	--	H2	12
	--	--	--	--	H3	12
	--	--	--	--	H4	12
H800401	--	--	--	--	H1	49
	--	--	--	--	H2	49
	--	--	--	--	H3	48
	--	--	--	--	H4	47
H800402	--	--	--	--	H1	50
	--	--	--	--	H2	50
	--	--	--	--	H3	49
	--	--	--	--	H4	48
H800403	--	--	--	--	H1	51
	--	--	--	--	H2	51
	--	--	--	--	H3	50
	--	--	--	--	H4	49
H800404	--	--	--	--	H1	52
	--	--	--	--	H2	52
	--	--	--	--	H3	51
	--	--	--	--	H4	50
H800405	--	--	--	--	H1	53
	--	--	--	--	H2	53
	--	--	--	--	H3	52
	--	--	--	--	H4	51
H800406	--	--	--	--	H1	54
	--	--	--	--	H2	54
	--	--	--	--	H3	53
	--	--	--	--	H4	52
H800501	--	--	--	--	H1	55
	--	--	--	--	H2	55
	--	--	--	--	H3	54
	--	--	--	--	H4	53
H800502	--	--	--	--	H1	56
	--	--	--	--	H2	56
	--	--	--	--	H3	55
	--	--	--	--	H4	54
H800503	--	--	--	--	H1	57
	--	--	--	--	H2	57
	--	--	--	--	H3	56
	--	--	--	--	H4	55
H800504	--	--	--	--	H1	58
	--	--	--	--	H2	58
	--	--	--	--	H3	57
	--	--	--	--	H4	56
H800505	--	--	--	--	H1	59
	--	--	--	--	H2	59
	--	--	--	--	H3	58
	--	--	--	--	H4	57
H800506	--	--	--	--	H1	60
	--	--	--	--	H2	60
	--	--	--	--	H3	59
	--	--	--	--	H4	58
H800507	--	--	--	--	H1	61
	--	--	--	--	H2	61
	--	--	--	--	H3	60
	--	--	--	--	H4	59

BEST COPY AVAILABLE

Table A.25
LITERATURE BACKGROUND ITEMS

FIELD	COHORT 1		COHORT 2		COHORT 3		FIELD	COHORT 1		COHORT 2		COHORT 3	
	BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM		BLOCK	ITEM	BLOCK	ITEM	BLOCK	ITEM
L800101	--	--	--	--	L1	1	L800901	--	--	--	--	L1	18
	--	--	--	--	L2	1		--	--	--	--	L2	18
	--	--	--	--	L3	1		--	--	--	--	L3	18
	--	--	--	--	L4	1		--	--	--	--	L4	18
L800201	--	--	--	--	L1	2	L801001	--	--	--	--	L1	49
	--	--	--	--	L2	2		--	--	--	--	L2	50
	--	--	--	--	L3	2		--	--	--	--	L3	49
	--	--	--	--	L4	2		--	--	--	--	L4	49
L800301	--	--	--	--	L1	3	L801101	--	--	--	--	L1	50
	--	--	--	--	L2	3		--	--	--	--	L2	51
	--	--	--	--	L3	3		--	--	--	--	L3	50
	--	--	--	--	L4	3		--	--	--	--	L4	50
L800401	--	--	--	--	L1	4	L801201	--	--	--	--	L1	51
	--	--	--	--	L2	4		--	--	--	--	L2	52
	--	--	--	--	L3	4		--	--	--	--	L3	51
	--	--	--	--	L4	4		--	--	--	--	L4	51
L800501	--	--	--	--	L1	5	L801202	--	--	--	--	L1	52
	--	--	--	--	L2	5		--	--	--	--	L2	53
	--	--	--	--	L3	5		--	--	--	--	L3	52
	--	--	--	--	L4	5		--	--	--	--	L4	52
L800601	--	--	--	--	L1	5	L801203	--	--	--	--	L1	53
	--	--	--	--	L2	5		--	--	--	--	L2	54
	--	--	--	--	L3	5		--	--	--	--	L3	53
	--	--	--	--	L4	5		--	--	--	--	L4	53
L800602	--	--	--	--	L1	6	L801204	--	--	--	--	L1	54
	--	--	--	--	L2	6		--	--	--	--	L2	55
	--	--	--	--	L3	6		--	--	--	--	L3	54
	--	--	--	--	L4	6		--	--	--	--	L4	54
L800603	--	--	--	--	L1	7	L801205	--	--	--	--	L1	55
	--	--	--	--	L2	7		--	--	--	--	L2	56
	--	--	--	--	L3	7		--	--	--	--	L3	55
	--	--	--	--	L4	7		--	--	--	--	L4	55
L800604	--	--	--	--	L1	8	L801206	--	--	--	--	L1	56
	--	--	--	--	L2	8		--	--	--	--	L2	57
	--	--	--	--	L3	8		--	--	--	--	L3	56
	--	--	--	--	L4	8		--	--	--	--	L4	56
L800605	--	--	--	--	L1	9	L801207	--	--	--	--	L1	57
	--	--	--	--	L2	9		--	--	--	--	L2	58
	--	--	--	--	L3	9		--	--	--	--	L3	57
	--	--	--	--	L4	9		--	--	--	--	L4	57
L800606	--	--	--	--	L1	10	L801208	--	--	--	--	L1	58
	--	--	--	--	L2	10		--	--	--	--	L2	59
	--	--	--	--	L3	10		--	--	--	--	L3	58
	--	--	--	--	L4	10		--	--	--	--	L4	58
L800607	--	--	--	--	L1	11	L801209	--	--	--	--	L1	59
	--	--	--	--	L2	11		--	--	--	--	L2	60
	--	--	--	--	L3	11		--	--	--	--	L3	59
	--	--	--	--	L4	11		--	--	--	--	L4	59
L800701	--	--	--	--	L1	12	L801301	--	--	--	--	L1	60
	--	--	--	--	L2	12		--	--	--	--	L2	61
	--	--	--	--	L3	12		--	--	--	--	L3	60
	--	--	--	--	L4	12		--	--	--	--	L4	60
L800702	--	--	--	--	L1	13	L801302	--	--	--	--	L1	61
	--	--	--	--	L2	13		--	--	--	--	L2	62
	--	--	--	--	L3	13		--	--	--	--	L3	61
	--	--	--	--	L4	13		--	--	--	--	L4	61
L800703	--	--	--	--	L1	14	L801303	--	--	--	--	L1	62
	--	--	--	--	L2	14		--	--	--	--	L2	63
	--	--	--	--	L3	14		--	--	--	--	L3	62
	--	--	--	--	L4	14		--	--	--	--	L4	62
L800704	--	--	--	--	L1	15	L801401	--	--	--	--	L1	63
	--	--	--	--	L2	15		--	--	--	--	L2	64
	--	--	--	--	L3	15		--	--	--	--	L3	63
	--	--	--	--	L4	15		--	--	--	--	L4	63
L800705	--	--	--	--	L1	16	L801402	--	--	--	--	L1	64
	--	--	--	--	L2	16		--	--	--	--	L2	65
	--	--	--	--	L3	16		--	--	--	--	L3	64
	--	--	--	--	L4	16		--	--	--	--	L4	64
L800801	--	--	--	--	L1	17	L801403	--	--	--	--	L1	65
	--	--	--	--	L2	17		--	--	--	--	L2	66
	--	--	--	--	L3	17		--	--	--	--	L3	65
	--	--	--	--	L4	17		--	--	--	--	L4	65

Table A.25
(continued)

FIELD	COHORT 1 BLOCK	COHORT 1 ITEM	COHORT 2 BLOCK	COHORT 2 ITEM	COHORT 3 BLOCK	COHORT 3 ITEM
L801404	--	--	--	--	L1	66
	--	--	--	--	L2	67
	--	--	--	--	L3	66
	--	--	--	--	L4	66
L801405	--	--	--	--	L1	67
	--	--	--	--	L2	68
	--	--	--	--	L3	67
	--	--	--	--	L4	67
L801406	--	--	--	--	L1	68
	--	--	--	--	L2	69
	--	--	--	--	L3	68
	--	--	--	--	L4	68
L801407	--	--	--	--	L1	69
	--	--	--	--	L2	70
	--	--	--	--	L3	69
	--	--	--	--	L4	69
L801408	--	--	--	--	L1	70
	--	--	--	--	L2	71
	--	--	--	--	L3	70
	--	--	--	--	L4	70
L801409	--	--	--	--	L1	71
	--	--	--	--	L2	[illegible]
	--	--	--	--	L3	71
	--	--	--	--	L4	71
L801410	--	--	--	--	L1	72
	--	--	--	--	L2	73
	--	--	--	--	L3	72
	--	--	--	--	L4	72

APPENDIX B

Conditioning Variables Tables

Appendix B

CONDITIONING VARIABLES TABLES

Appendix B contains tables of estimated effects for the conditioning variables used in the construction of plausible values for reading, mathematics, and science.

Tables B.1 through B.3 show the effects, by grade/age, for reading.

Tables B.4, B.6, and B.8 give the conditioning variables, by grade/age, used for all mathematics subscales. The estimated effects for these conditioning variables appear in Tables B.5, B.7, and B.9. Tables B.10 through B.20 are for trend in mathematics. Each table gives conditioning variables and their estimated effects for a given age and assessment year.

Similarly, the conditioning variables for the science subscales appear in Tables B.21, B.23, and B.25 and the estimated effects in Tables B.22, B.24, and B.26. Tables B.27 through B.37 give the conditioning variables and effects, by age and assessment year, for science trend.

Note that all effect estimates are in the metrics used in the original calibration of the scale or subscale. The transformations needed to represent these effects in terms of the metric of the final reporting scales appear in the chapters which describe the scaling of each subject area. Note also that certain conditioning variables do not have effect estimates. This is because those variables are exact linear combinations of the other conditioning variables.

Table B.1

Estimated Effects for Reading Conditioning Variables, Grade 3/Age 9

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-1.416868	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	0.134737	2 SEX (FEMALE)
3	ETHNIC2	-0.151446	3 ETHNICITY (BLACK)
4	ETHNIC3	-0.232955	4 ETHNICITY (HISPANIC)
5	ETHNIC4	-1.638121	5 ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.157261	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.131141	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.066794	8 REGION (SOUTHEAST)
9	REGION3	-0.007434	9 REGION (CENTRAL)
10	REGION4	-0.066843	10 REGION (WEST)
11	PARED2	0.088011	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.211662	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.242878	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.139631	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	0.071657	15 ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	0.123210	16 ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	0.103606	17 HOURS TV WATCHING (LINEAR)
18	TV**2	-0.019185	18 HOURS TV WATCHING (QUADRATIC)
19	HW-YES	0.043739	19 HOMEWORK (YES - SOME AMOUNT)
20	HW-2345	-0.024127	20 HOMEWORK AMOUNT (LINEAR)
21	LM BY E3	0.028126	21 LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
22	LM BY E4	0.334282	22 LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
23	LM BY E_	-0.067490	23 LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
24	LUNCH%	-0.080313	24 PERCENT IN LUNCH PROGRAM
25	LUNCH_	-0.082898	25 LUNCH PROGRAM (MISSING)
26	%WHITE49	-0.142514	26 PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
27	%WHITE79	-0.041980	27 PERCENT WHITE IN SCHOOL (50-79% INTEGRATED)
	%WHITE00		28 PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
28	E2 X SEX	0.127858	29 ETHNICITY BY GENDER (BLACK FEMALE)
29	E3 X SEX	0.098589	30 ETHNICITY BY GENDER (HISPANIC FEMALE)
30	E4 X SEX	0.040797	31 ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
31	E2 X PE2	-0.142674	32 ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
32	E2 X PE3	-0.224876	33 ETHNICITY BY PARENT'S ED (BLACK, POST HS)
33	E2 X PE4	-0.066695	34 ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
34	E2 X PE_	-0.054574	35 ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
35	E3 X PE2	-0.044825	36 ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
36	E3 X PE3	-0.180012	37 ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
37	E3 X PE4	-0.147884	38 ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
38	E3 X PE_	0.014333	39 ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
	E4 X PE2		40 ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
39	E4 X PE3	1.115009	41 ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
40	E4 X PE4	1.483300	42 ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
41	E4 X PE_	1.427857	43 ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
42	MA,<MG	-0.399390	44 MODAL AGE, LESS THAN MODAL GRADE

Table B.1
(continued)

	VARIABLE LABEL	ESTIMATED EFFECT		DESCRIPTION
43	MA,MG	0.029070	45	MODAL AGE, MODAL GRADE, MISSING
44	MA,>MG	0.414784	46	MODAL AGE, GREATER THAN MODAL GRADE
45	>MA,MG	-0.263028	47	GREATER THAN MODAL AGE, MODAL GRADE
46	SCH TYPE	0.026332	48	SCHOOL TYPE (NOT PUBLIC)
47	ASK SW?	0.050731	49	FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
48	PRESCH1	0.077444	50	WENT TO PRESCHOOL (YES)
49	#PARENT1	0.175494	51	SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
50	MOTHER	-0.027370	52	MOTHER AT HOME
51	MOWORK	0.012694	53	MOTHER WORKS OUTSIDE (YES)
52	SCI123	0.054960	54	SPENT AT LEAST ONCE A WEEK STUDYING SCIENCE
53	SCI45	0.019661	55	SPENT < ONCE A WEEK OR NEVER STUDYING SCIENCE
54	COMPUTER	0.022764	56	USE COMPUTERS FOR MATH, READING, ETC. (YES)
55	SUPERVIS	0.071617	57	ADULT SUPERVISION OF STUDENT AFTER SCHOOL(YES)
56	MATH Q1	-0.274396	58	MATH QUANTILE (LINEAR -1,0,1)
57	SCI Q1	-0.281302	59	SCIENCE QUANTILE (LINEAR -1,0,1)
58	SAMPLE	-0.445823	60	BIB SAMPLE

Table B.2

Estimated Effects for Reading Conditioning Variables, Grade 7/Age 13

	VARIABLE LABEL	ESTIMATED EFFECT		DESCRIPTION
1	OVERALL	-0.943157	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	0.160314	2	SEX (FEMALE)
3	ETHNIC2	-0.075165	3	ETHNICITY (BLACK)
4	ETHNIC3	-0.071093	4	ETHNICITY (HISPANIC)
5	ETHNIC4	-0.077456	5	ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.091970	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.050839	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.016276	8	REGION (SOUTHEAST)
9	REGION3	-0.039972	9	REGION (CENTRAL)
10	REGION4	-0.062560	10	REGION (WEST)
11	PARED2	-0.027861	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.086129	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.032187	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	-0.067058	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	0.086084	15	ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	0.121662	16	ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	0.092448	17	HOURS TV WATCHING (LINEAR)
18	TV**2	-0.016185	18	HOURS TV WATCHING (QUADRATIC)
19	HW-NO	-0.222397	19	HOMEWORK (DON'T HAVE ANY)
20	HW-YES	-0.150057	20	HOMEWORK (YES - SOME AMOUNT)
21	HW-2345	0.018195	21	HOMEWORK AMOUNT (LINEAR)
22	LM BY E3	0.042232	22	LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
23	LM BY E4	-0.038987	23	LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
24	LM BY E_	-0.067731	24	LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
25	LUNCH%	0.049258	25	PERCENT IN LUNCH PROGRAM
26	LUNCH_	-0.063302	26	LUNCH PROGRAM (MISSING)
27	%WHITE49	-0.074382	27	PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
28	%WHITE79	0.023343	28	PERCENT WHITE IN SCHOOL (50-79% INTEGRATED)
	%WHITE00		29	PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
29	E2 X SEX	0.001750	30	ETHNICITY BY GENDER (BLACK FEMALE)
30	E3 X SEX	0.029345	31	ETHNICITY BY GENDER (HISPANIC FEMALE)
31	E4 X SEX	-0.008379	32	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
32	E2 X PE2	-0.052449	33	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
33	E2 X PE3	-0.084803	34	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
34	E2 X PE4	-0.120141	35	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
35	E2 X PE_	-0.036973	36	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
36	E3 X PE2	-0.170683	37	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
37	E3 X PE3	-0.227141	38	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
38	E3 X PE4	-0.175748	39	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
39	E3 X PE_	-0.127979	40	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
40	E4 X PE2	0.012545	41	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
41	E4 X PE3	-0.141419	42	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
42	E4 X PE4	0.220770	43	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
43	E4 X PE_	0.103496	44	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)

Table B.2
(continued)

	VARIABLE LABEL	ESTIMATED EFFECT		DESCRIPTION
44	MA,<MG	-0.362952	45	MODAL AGE, LESS THAN MODAL GRADE
45	MA,MG	-0.046980	46	MODAL AGE, MODAL GRADE, MISSING
46	MA,>MG	0.129974	47	MODAL AGE, GREATER THAN MODAL GRADE
47	>MA,MG	-0.284088	48	GREATER THAN MODAL AGE, MODAL GRADE
48	SCH TYPE	0.153836	49	SCHOOL TYPE (NOT PUBLIC)
49	ASK SW?	0.022892	50	FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
50	PRESCH1	0.060263	51	WENT TO PRESCHOOL (YES)
51	#PARENT1	-0.012825	52	SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
52	MOTHER	-0.025736	53	MOTHER AT HOME
53	MOWORK	-0.015841	54	MOTHER WORKS OUTSIDE (YES)
54	COMPUTER	-0.068049	55	USE COMPUTERS FOR MATH, READING, ETC. (YES)
55	MATH2	0.164571	56	TYPE OF MATH CLASS(REGULAR MATH)
56	MATH3	0.241884	57	TYPE OF MATH CLASS(PRE-ALGEBRA)
57	MATH45	0.189397	58	TYPE OF MATH CLASS(ALGEBRA)
58	SCIENCE2	0.151230	59	STUDYING IN SCIENCE THIS YEAR (LIFE SCIENCE)
59	SCIENCE3	0.108702	60	STUDYING IN SCIENCE THIS YEAR (PHYSICAL SCIENCE)
60	SCIENCE4	0.112368	61	STUDYING IN SCIENCE THIS YEAR (EARTH SCIENCE)
61	SCIENCE5	0.195202	62	STUDYING IN SCIENCE THIS YEAR (GENERAL SCIENCE)
62	GRADES	0.236329	63	GRADES IN SCHOOL (LINEAR)
63	MATH Q1	-0.150790	64	MATH QUANTILE (LINEAR -1,0,1)
64	SCI Q1	-0.260019	65	SCIENCE QUANTILE (LINEAR -1,0,1)
65	SAMPLE	-0.110011	66	BIB SAMPLE

Table B.3

Estimated Effects for Reading Conditioning Variables, Grade 11/Age 17

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-0.459690	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	0.208740	2 SEX (FEMALE)
3	ETHNIC2	-0.179031	3 ETHNICITY (BLACK)
4	ETHNIC3	-0.190122	4 ETHNICITY (HISPANIC)
5	ETHNIC4	-0.375032	5 ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.155906	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.064686	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.004313	8 REGION (SOUTHEAST)
9	REGION3	0.037366	9 REGION (CENTRAL)
10	REGION4	-0.024202	10 REGION (WEST)
11	PARED2	-0.015655	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.060401	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.089310	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	-0.215376	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	0.108733	15 ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	0.141402	16 ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	0.028707	17 HOURS TV WATCHING (LINEAR)
18	TV**2	-0.008759	18 HOURS TV WATCHING (QUADRATIC)
19	HW-NO	-0.405091	19 HOMEWORK (DON'T HAVE ANY)
20	HW-YES	-0.175868	20 HOMEWORK (YES - SOME AMOUNT)
21	HW-2345	-0.003929	21 HOMEWORK AMOUNT (LINEAR)
22	LM BY E3	-0.075719	22 LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
23	LM BY E4	-0.170266	23 LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
24	LM BY E_	0.016883	24 LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
25	LUNCH%	-0.122057	25 PERCENT IN LUNCH PROGRAM
26	LUNCH_	-0.037937	26 LUNCH PROGRAM (MISSING)
27	%WHITE49	0.012205	27 PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
28	%WHITE79	0.036887	28 PERCENT WHITE IN SCHOOL (50-79% INTEGRATED)
	%WHITE00		29 PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
29	E2 X SEX	-0.144274	30 ETHNICITY BY GENDER (BLACK FEMALE)
30	E3 X SEX	0.006474	31 ETHNICITY BY GENDER (HISPANIC FEMALE)
31	E4 X SEX	0.110695	32 ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
32	E2 X PE2	-0.063329	33 ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
33	E2 X PE3	0.047861	34 ETHNICITY BY PARENT'S ED (BLACK, POST HS)
34	E2 X PE4	-0.065619	35 ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
35	E2 X PE_	0.103087	36 ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
36	E3 X PE2	-0.041342	37 ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
37	E3 X PE3	0.032451	38 ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
38	E3 X PE4	0.008064	39 ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
39	E3 X PE_	0.179269	40 ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
40	E4 X PE2	0.081702	41 ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
41	E4 X PE3	0.311960	42 ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
42	E4 X PE4	0.247000	43 ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
43	E4 X PE_	0.388056	44 ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)

Table B.3
(continued)

	VARIABLE LABEL	ESTIMATED EFFECT		DESCRIPTION
44	MA,<MG	-0.329648	45	MODAL AGE, LESS THAN MODAL GRADE
45	MA,MG	-0.053659	46	MODAL AGE, MODAL GRADE, MISSING
46	MA,>MG	0.027352	47	MODAL AGE, GREATER THAN MODAL GRADE
47	>MA,MG	-0.250503	48	GREATER THAN MODAL AGE, MODAL GRADE
48	SCH TYPE	0.063927	49	SCHOOL TYPE (NOT PUBLIC)
49	ASK SW?	-0.034854	50	FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
50	PRESCH1	0.001747	51	WENT TO PRESCHOOL (YES)
51	#PARENT1	0.008337	52	SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
52	MOTHER	-0.041225	53	MOTHER AT HOME
53	MOWORK	0.000683	54	MOTHER WORKS OUTSIDE (YES)
54	GRADES	0.215902	55	GRADES IN SCHOOL (LINEAR)
55	PROGRAM2	0.133872	56	HIGH SCHOOL PROGRAM(COLLEGE PREPARATORY)
56	PROGRAM3	-0.046951	57	HIGH SCHOOL PROGRAM(VOCATIONAL)
57	MATH	0.075715	58	NUMBER OF MATH COURSES
58	SCIENCE	0.067684	59	NUMBER OF SCIENCE COURSES
59	POSTSEC2	0.066029	60	TWO-YEAR COLLEGE
60	POSTSEC3	0.178022	61	FOUR-YEAR COLLEGE
61	HRS WORK	-0.067968	62	HOURS OF OUTSIDE WORK
62	ENGL23	0.122914	63	TYPES OF ENGLISH CLASS(ADVANCED&COLLEGE PREP.)
63	ENGLISH5	-0.193832	64	TYPES OF ENGLISH CLASS(REMEDIAL)
64	MATH Q1	-0.175274	65	MATH QUANTILE (LINEAR -1,0,1)
65	SCI Q1	-0.288030	66	SCIENCE QUANTILE (LINEAR -1,0,1)

Table B.4

Mathematics Conditioning Variables, Grade 3/Age 9

	VARIABLE LABEL	DESCRIPTION
1	OVERALL	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	2 SEX (FEMALE)
3	ETHNIC2	3 ETHNICITY (BLACK)
4	ETHNIC3	4 ETHNICITY (HISPANIC)
5	ETHNIC4	5 ETHNICITY (ASIAN AMERICAN)
6	STOC2	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	8 REGION (SOUTHEAST)
9	REGION3	9 REGION (CENTRAL)
10	REGION4	10 REGION (WEST)
11	PARED2	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	15 ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	16 ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	17 HOURS TV WATCHING (LINEAR)
18	TV**2	18 HOURS TV WATCHING (QUADRATIC)
19	HW-YES	19 HOMEWORK (YES - SOME AMOUNT)
20	HW-2345	20 HOMEWORK AMOUNT (LINEAR)
21	LM BY E3	21 LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
22	LM BY E4	22 LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
23	LM BY E_	23 LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
24	LUNCH%	24 PERCENT IN LUNCH PROGRAM
25	LUNCH_	25 LUNCH PROGRAM (MISSING)
26	%WHITE49	26 PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
27	%WHITE79	27 PERCENT WHITE IN SCHOOL (50-79% INTEGRATED)
	%WHITE00	28 PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
28	E2 X SEX	29 ETHNICITY BY GENDER (BLACK FEMALE)
29	E3 X SEX	30 ETHNICITY BY GENDER (HISPANIC FEMALE)
30	E4 X SEX	31 ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
31	E2 X PE2	32 ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
32	E2 X PE3	33 ETHNICITY BY PARENT'S ED (BLACK, POST HS)
33	E2 X PE4	34 ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
34	E2 X PE_	35 ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
35	E3 X PE2	36 ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
36	E3 X PE3	37 ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
37	E3 X PE4	38 ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
38	E3 X PE_	39 ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
	E4 X PE2	40 ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
39	E4 X PE3	41 ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
40	E4 X PE4	42 ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
41	E4 X PE_	43 ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
42	MA,<MG	44 MODAL AGE, LESS THAN MODAL GRADE

Table B.4
(continued)

	VARIABLE LABEL		DESCRIPTION
43	MA,MG	45	MODAL AGE, MODAL GRADE, MISSING
44	MA,>MG	46	MODAL AGE, GREATER THAN MODAL GRADE
45	>MA,MG	47	GREATER THAN MODAL AGE, MODAL GRADE
46	SCH TYPE	48	SCHOOL TYPE (NOT PUBLIC)
47	ASK SW?	49	FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
48	PRESCH1	50	WENT TO PRESCHOOL (YES)
49	#PARENT1	51	SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
50	MOTHER	52	MOTHER AT HOME
51	MOWORK	53	MOTHER WORKS OUTSIDE (YES)
52	SCI123	54	SPENT AT LEAST ONCE A WEEK STUDYING SCIENCE
53	SCI45	55	SPENT < ONCE A WEEK OR NEVER STUDYING SCIENCE
54	COMPUTER	56	USE COMPUTERS FOR MATH, READING, ETC. (YES)
55	SUPERVIS	57	ADULT SUPERVISION OF STUDENT AFTER SCHOOL(YES)
56	MATH Q1	58	MATH QUANTILE (LINEAR -1,0,1)
57	SCI Q1	59	SCIENCE QUANTILE (LINEAR -1,0,1)

Table B.5

Estimated Effects for Mathematics Conditioning Variables, Grade 3/Age 9

	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5
1	-0.946172	-1.218839	-1.392913
2	-0.117644	-0.055138	0.001133
3	-0.237354	-0.090877	-0.273892
4	-0.230329	-0.185513	0.053999
5	-1.129916	-1.191336	-0.388513
6	0.173127	0.153634	0.177416
7	0.038667	0.042726	0.067788
8	0.000488	0.052812	0.089764
9	0.063241	0.078478	-0.046947
10	-0.008171	0.013199	-0.012076
11	0.027463	0.118840	0.027394
12	0.167774	0.271684	0.255879
13	0.174402	0.268882	0.184006
14	0.059968	0.214283	0.129780
15	0.059607	0.090701	0.111263
16	0.131430	0.134616	0.164054
17	0.126861	0.160665	0.147785
18	-0.018847	-0.023137	-0.022627
19	-0.032778	0.272767	0.421672
20	-0.026220	-0.031712	-0.009785
21	-0.020154	-0.138456	0.051248
22	0.339933	0.506240	0.330273
23	-0.010525	0.122951	-0.012716
24	-0.153557	-0.222950	-0.260143
25	-0.056131	-0.044131	-0.036394
26	-0.079226	-0.030625	-0.010398
27	-0.020886	-0.028026	-0.002443
28	0.128932	0.111914	0.106072
29	-0.032425	-0.030307	-0.039899
30	-0.161538	0.002850	0.070964
31	-0.046617	-0.183305	-0.069007
32	-0.010292	-0.132254	-0.113742
33	-0.100050	-0.279062	-0.061269
34	-0.045574	-0.247596	0.002515
35	0.032819	0.143784	-0.232536
36	0.091916	-0.010643	-0.092038
37	0.022051	-0.015300	-0.191471
38	0.094694	0.130126	-0.150769
39	1.092026	0.470541	0.283398
40	0.616160	0.926217	0.045507
41	0.669838	0.984378	0.100432
42	0.967825	1.193762	0.375092
43	-0.617882	-0.614600	-1.001589
44	0.000186	0.056692	0.034156
45	0.318059	0.350188	0.509326

Table B.5
(continued)

	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5
46	-0.203138	-0.137937	-0.153053
47	-0.045163	-0.050615	-0.096315
48	0.013182	-0.015853	0.032462
49	0.055456	0.108480	0.097324
50	0.053331	0.095496	0.094727
51	0.089618	0.006504	-0.024782
52	-0.003609	-0.014105	0.033141
53	-0.160670	-0.190548	-0.255744
54	-0.181168	-0.244880	-0.305094
55	0.006140	-0.010925	0.015374
56	0.070747	0.023675	0.045945
57	-0.188164	-0.199973	-0.187535

Table B.6

Mathematics Conditioning Variables, Grade 7/Age 13

	VARIABLE LABEL		DESCRIPTION
1	OVERALL	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	2	SEX (FEMALE)
3	ETHNIC2	3	ETHNICITY (BLACK)
4	ETHNIC3	4	ETHNICITY (HISPANIC)
5	ETHNIC4	5	ETHNICITY (ASIAN AMERICAN)
6	STOC2	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	8	REGION (SOUTHEAST)
9	REGION3	9	REGION (CENTRAL)
10	REGION4	10	REGION (WEST)
11	PARED2	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	15	ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	16	ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	17	HOURS TV WATCHING (LINEAR)
18	TV**2	18	HOURS TV WATCHING (QUADRATIC)
19	HW-NO	19	HOMEWORK (DON'T HAVE ANY)
20	HW-YES	20	HOMEWORK (YES - SOME AMOUNT)
21	HW-2345	21	HOMEWORK AMOUNT (LINEAR)
22	LM BY E3	22	LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
23	LM BY E4	23	LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
24	LM BY E_	24	LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
25	LUNCH%	25	PERCENT IN LUNCH PROGRAM
26	LUNCH_	26	LUNCH PROGRAM (MISSING)
27	%WHITE49	27	PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
28	%WHITE79	28	PERCENT WHITE IN SCHOOL (50%-79%)
	%WHITE00	29	PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
29	E2 X SEX	30	ETHNICITY BY GENDER (BLACK FEMALE)
30	E3 X SEX	31	ETHNICITY BY GENDER (HISPANIC FEMALE)
31	E4 X SEX	32	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
32	E2 X PE2	33	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
33	E2 X PE3	34	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
34	E2 X PE4	35	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
35	E2 X PE_	36	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
36	E3 X PE2	37	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
37	E3 X PE3	38	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
38	E3 X PE4	39	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
39	E3 X PE_	40	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
40	E4 X PE2	41	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
41	E4 X PE3	42	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
42	E4 X PE4	43	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
43	E4 X PE_	44	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)

Table B.6
(continued)

	VARIABLE LABEL	DESCRIPTION
44	MA,<MG	45 MODAL AGE, LESS THAN MODAL GRADE
45	MA,MG	46 MODAL AGE, MODAL GRADE, MISSING
46	MA,>MG	47 MODAL AGE, GREATER THAN MODAL GRADE
47	>MA,MG	48 GREATER THAN MODAL AGE, MODAL GRADE
48	SCH TYPE	49 SCHOOL TYPE (NOT PUBLIC)
49	ASK SW?	50 FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
50	PRESCH1	51 WENT TO PRESCHOOL (YES)
51	#PARENT1	52 SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
52	MOTHER	53 MOTHER AT HOME
53	MOWORK	54 MOTHER WORKS OUTSIDE (YES)
54	COMPUTER	55 USE COMPUTERS FOR MATH, READING, ETC. (YES)
55	MATH2	56 TYPE OF MATH CLASS(REGULAR MATH)
56	MATH3	57 TYPE OF MATH CLASS(PRE-ALGEBRA)
57	MATH45	58 TYPE OF MATH CLASS(ALGEBRA)
58	SCIENCE2	59 STUDYING IN SCIENCE THIS YEAR (LIFE SCIENCE)
59	SCIENCE3	60 STUDYING IN SCIENCE THIS YEAR (PHYSICAL SCIENCE)
60	SCIENCE4	61 STUDYING IN SCIENCE THIS YEAR (EARTH SCIENCE)
61	SCIENCE5	62 STUDYING IN SCIENCE THIS YEAR (GENERAL SCIENCE)
62	GRADES	63 GRADES IN SCHOOL (LINEAR)
63	MATH Q1	64 MATH QUANTILE (LINEAR -1,0,1)
64	SCI Q1	65 SCIENCE QUANTILE (LINEAR -1,0,1)

Table B.7

Estimated Effects for Mathematics Conditioning Variables, Grade 7/Age 13

	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5	SUBSCALE 6
1	-0.352342	-0.237241	-0.232741	-1.566806
2	-0.118358	-0.121051	0.027736	-0.138846
3	-0.243163	-0.241068	-0.192695	-0.157660
4	-0.143504	-0.086834	-0.087586	0.001369
5	0.154143	-0.123063	0.329942	-0.345517
6	0.106950	0.043702	0.072136	-0.007275
7	0.041103	0.005016	0.027964	0.002061
8	-0.101002	-0.076939	-0.068503	-0.121620
9	-0.019602	0.003319	-0.066997	-0.101269
10	-0.133251	-0.104762	-0.067039	-0.239011
11	-0.015131	0.076167	-0.039755	0.118204
12	0.109763	0.215349	0.087665	0.247897
13	0.149055	0.215896	0.092551	0.259444
14	-0.053523	-0.008094	-0.054022	0.173222
15	0.082457	0.020266	0.062806	0.085506
16	0.065393	0.048085	0.074417	0.161452
17	0.073241	0.057704	0.078217	0.032170
18	-0.014776	-0.011898	-0.010180	-0.009676
19	-0.147903	-0.230917	-0.150158	0.055594
20	-0.080464	-0.141038	-0.087860	0.117139
21	-0.006627	-0.024537	-0.000802	-0.008386
22	0.058210	0.017234	0.072507	-0.002178
23	0.061216	-0.023127	-0.049094	-0.273219
24	-0.090200	-0.051471	-0.086291	0.030243
25	-0.098591	-0.070908	-0.101800	-0.432306
26	-0.006329	-0.008319	-0.050810	-0.061885
27	-0.073191	-0.042237	-0.111685	-0.027993
28	-0.002039	-0.006013	-0.015316	0.084651
29	0.001871	0.016668	-0.064368	0.045342
30	0.027987	0.017813	0.009011	-0.025125
31	-0.183716	-0.048277	-0.239876	0.125414
32	0.056019	0.004230	0.187129	-0.033398
33	-0.013261	0.014572	0.096781	-0.261570
34	-0.134803	-0.105469	-0.010082	-0.231216
35	0.079497	0.026672	0.088876	-0.187968
36	0.013273	-0.019971	0.018582	0.009769
37	0.007303	0.024266	-0.092669	-0.234611
38	-0.058938	-0.063571	-0.045748	-0.058699
39	-0.011958	-0.024379	0.054089	-0.053586
40	0.023058	0.089013	-0.511295	-0.484603
41	0.132417	0.296604	-0.068088	0.211198
42	-0.021448	0.395627	0.022164	0.878078
43	0.043843	0.513521	0.048291	0.527336
44	-0.351336	-0.447323	-0.429661	-0.283039
45	0.015146	-0.072972	0.002604	0.099541

Table B.7
(continued)

	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5	SUBSCALE 6
46	0.250522	0.185706	0.310623	0.454944
47	-0.172210	-0.257649	-0.155813	-0.062705
48	-0.024782	0.024806	0.008822	0.020517
49	-0.067612	-0.066211	-0.051669	-0.079223
50	0.033094	0.025928	0.013399	0.039496
51	0.041589	0.016149	0.007752	0.041884
52	-0.011835	-0.040056	0.017938	0.062273
53	0.007768	-0.014835	-0.006762	-0.053299
54	-0.075113	-0.089896	-0.068931	-0.119231
55	0.075070	0.101699	0.001479	0.046058
56	0.262637	0.290710	0.199434	0.311969
57	0.129170	0.211722	0.021191	0.089921
58	0.071305	0.052191	0.106246	0.127636
59	0.084178	0.009127	0.036155	0.056185
60	0.061501	0.008557	0.078339	0.049026
61	0.117946	0.066933	0.079968	0.057133
62	0.225022	0.253259	0.227615	0.306723
63	-0.145286	-0.196210	-0.118398	-0.193678
64	-0.202314	-0.177616	-0.169222	-0.270378

Table B.8

Mathematics Conditioning Variables, Grade 11/Age 17

	VARIABLE LABEL		DESCRIPTION
1	OVERALL	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	2	SEX (FEMALE)
3	ETHNIC2	3	ETHNICITY (BLACK)
4	ETHNIC3	4	ETHNICITY (HISPANIC)
5	ETHNIC4	5	ETHNICITY (ASIAN AMERICAN)
6	STOC2	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	8	REGION (SOUTHEAST)
9	REGION3	9	REGION (CENTRAL)
10	REGION4	10	REGION (WEST)
11	PARED2	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	15	ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	16	ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	17	HOURS TV WATCHING (LINEAR)
18	TV**2	18	HOURS TV WATCHING (QUADRATIC)
19	HW-NO	19	HOMEWORK (DON'T HAVE ANY)
20	HW-YES	20	HOMEWORK (YES - SOME AMOUNT)
21	HW-2345	21	HOMEWORK AMOUNT (LINEAR)
22	LM BY E3	22	LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
23	LM BY E4	23	LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
24	LM BY E_	24	LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
25	LUNCH%	25	PERCENT IN LUNCH PROGRAM
26	LUNCH_	26	LUNCH PROGRAM (MISSING)
27	%WHITE49	27	PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
28	%WHITE79	28	PERCENT WHITE IN SCHOOL (50-79% INTEGRATED)
	%WHITE00	29	PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
29	E2 X SEX	30	ETHNICITY BY GENDER (BLACK FEMALE)
30	E3 X SEX	31	ETHNICITY BY GENDER (HISPANIC FEMALE)
31	E4 X SEX	32	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
32	E2 X PE2	33	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
33	E2 X PE3	34	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
34	E2 X PE4	35	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
35	E2 X PE_	36	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
36	E3 X PE2	37	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
37	E3 X PE3	38	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
38	E3 X PE4	39	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
39	E3 X PE_	40	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
40	E4 X PE2	41	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
41	E4 X PE3	42	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
42	E4 X PE4	43	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)

Table B.8
(continued)

	VARIABLE LABEL		DESCRIPTION
43	E4 X PE_	44	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
44	MA,<MG	45	MODAL AGE, LESS THAN MODAL GRADE
45	MA,MG	46	MODAL AGE, MODAL GRADE, MISSING
46	MA,>MG	47	MODAL AGE, GREATER THAN MODAL GRADE
47	>MA,MG	48	GREATER THAN MODAL AGE, MODAL GRADE
48	SCH TYPE	49	SCHOOL TYPE (NOT PUBLIC)
49	ASK SW?	50	FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
50	PRESCH1	51	WENT TO PRESCHOOL (YES)
51	#PARENT1	52	SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
52	MOTHER	53	MOTHER AT HOME
53	MOWORK	54	MOTHER WORKS OUTSIDE (YES)
54	GRADES	55	GRADES IN SCHOOL (LINEAR)
55	PROGRAM2	56	HIGH SCHOOL PROGRAM(COLLEGE PREPARATORY)
56	PROGRAM3	57	HIGH SCHOOL PROGRAM(VOCATIONAL)
57	MATH	58	NUMBER OF MATH COURSES
58	SCIENCE	59	NUMBER OF SCIENCE COURSES
59	POSTSEC2	60	TWO-YEAR COLLEGE
60	POSTSEC3	61	FOUR-YEAR COLLEGE
61	HRS WORK	62	HOURS OF OUTSIDE WORK
62	ENGL23	63	TYPES OF ENGLISH CLASS(ADVANCED&COLLEGE PREP.)
63	ENGLISH5	64	TYPES OF ENGLISH CLASS(REMEDIAL)
64	MATH Q1	65	MATH QUANTILE (LINEAR -1,0,1)
65	SCI Q1	66	SCIENCE QUANTILE (LINEAR -1,0,1)

Table B.9

Estimated Effects for Mathematics Conditioning Variables, Grade 11/Age 17

	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5	SUBSCALE 6	SUBSCALE 7
1	0.195858	0.304516	0.142497	-0.541098	-1.119437
2	-0.246885	-0.193048	-0.021336	-0.260969	-0.073420
3	-0.344944	-0.270933	-0.160073	-0.470358	-0.260151
4	-0.191312	-0.137035	-0.171029	-0.063208	-0.114471
5	0.294510	-0.084349	0.215611	0.411057	0.182352
6	0.215009	0.151762	0.135865	0.148188	0.208643
7	0.137500	0.050463	0.063095	0.042328	0.039243
8	-0.052084	-0.016224	0.041018	-0.068872	-0.002903
9	0.072164	0.053202	0.017236	0.010793	0.038770
10	-0.010277	-0.023525	-0.012635	-0.062159	-0.086379
11	0.018629	0.018233	-0.041512	0.035876	-0.062526
12	0.094391	0.056743	0.004418	0.146590	0.037264
13	0.066504	0.053733	-0.023865	0.175210	0.017065
14	-0.229595	-0.080071	-0.132718	-0.097598	-0.179930
15	0.041714	0.046100	0.063375	0.068467	0.063649
16	0.056468	0.060345	0.041185	0.062993	0.079294
17	-0.006456	0.015476	0.019801	0.030363	-0.014262
18	-0.003765	-0.007944	-0.005793	-0.010510	-0.003715
19	-0.317430	-0.175180	-0.133841	-0.490315	-0.342579
20	-0.152795	0.001618	-0.025344	-0.161060	-0.227831
21	-0.027925	-0.024972	-0.005854	-0.006740	0.002900
22	0.043355	0.030421	0.021115	0.093909	-0.006710
23	-0.167295	-0.190842	-0.167424	-0.335473	0.025287
24	-0.095753	-0.061741	-0.043180	-0.112555	-0.007060
25	-0.118837	-0.109148	-0.005480	-0.185414	-0.258239
26	-0.028970	-0.037728	-0.023312	0.006773	-0.003202
27	-0.032063	-0.006945	-0.038716	-0.073542	0.036574
28	-0.001481	0.029177	0.023390	0.012689	0.060631
29	0.069319	0.044137	0.064818	0.036009	0.030742
30	-0.042455	0.038289	0.064913	-0.109547	0.004549
31	0.287757	-0.054389	-0.022413	0.157593	-0.160585
32	-0.129335	-0.100427	0.017015	-0.017924	0.023126
33	-0.213154	-0.060476	-0.108509	-0.007431	-0.178859
34	-0.104558	-0.062576	-0.054697	-0.128184	-0.071275
35	0.166319	0.015014	0.170531	0.046204	-0.074330
36	-0.060255	-0.082799	0.045010	-0.084824	0.023171
37	0.001950	-0.086444	-0.052552	-0.035716	-0.145061
38	0.038466	0.023252	0.038175	-0.201052	-0.070557
39	0.192027	-0.045704	0.111945	0.059751	0.128328
40	-0.248807	0.041465	-0.068258	-0.381340	0.124824
41	-0.265656	0.359645	-0.133069	-0.478293	0.049367
42	-0.132709	0.349036	0.100124	-0.193004	0.067695
43	-0.013802	0.236105	0.174070	0.007380	0.160958
44	-0.133187	-0.216247	-0.122409	-0.253036	-0.230837
45	-0.010745	-0.006971	-0.015074	-0.050555	-0.040595

Table B.9
(continued)

	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5	SUBSCALE 6	SUBSCALE 7
46	-0.020861	0.023623	-0.026568	-0.182436	-0.090257
47	-0.114376	-0.141685	-0.129027	-0.269012	-0.292650
48	-0.046394	-0.093190	-0.019327	-0.077206	-0.019410
49	-0.043236	-0.030714	-0.006119	-0.052606	-0.051349
50	0.003831	0.000824	0.011364	0.030711	0.035063
51	0.036420	0.002728	-0.000217	-0.003587	-0.006095
52	-0.088439	-0.066550	-0.042036	-0.143390	-0.106678
53	0.038097	0.004660	0.004990	0.071296	0.053183
54	0.197311	0.148064	0.135622	0.248827	0.252311
55	0.092162	0.077809	0.054228	0.143756	0.198307
56	0.040549	0.001035	-0.033087	0.015966	-0.056789
57	0.117385	0.122233	0.113171	0.229784	0.237471
58	0.056018	0.044501	0.019986	0.040499	0.014109
59	-0.059698	0.001888	0.014762	-0.034046	0.022275
60	0.057070	0.112711	0.086981	0.136935	0.199039
61	-0.027140	-0.048412	-0.077096	-0.080121	-0.086530
62	0.082593	0.063262	0.059468	0.113782	0.140638
63	-0.077388	-0.132642	-0.012501	-0.185554	-0.020404
64	-0.175084	-0.203456	-0.123231	-0.195708	-0.156517
65	-0.258420	-0.198467	-0.154683	-0.296144	-0.233239

Table B.10

Estimated Effects for Mathematics Trend Conditioning Variables 1977-78: Age 9

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-0.273301	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	0.026875	GENDER2	SEX (FEMALE)
3	-0.705243	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.218671	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.299975	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.453148	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.210676	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.304078	REGION2	REGION (SOUTHEAST)
9	-0.018972	REGION3	REGION (CENTRAL)
10	-0.267138	REGION4	REGION (WEST)
11	0.283547	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.461085	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.444294	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	0.123491	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.899835	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.466793	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.297460	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.445589	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.139820	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	-0.110746	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	-0.094134	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.026872	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.165483	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.014514	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	0.047939	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	0.290944	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.095222	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.275784	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	0.090747	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	-0.090926	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	0.018214	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	0.010844	SCH.PRIV	SCHOOL TYPE (PRIVATE)

Table B.11

Estimated Effects for Mathematics Trend Conditioning Variables
1977-78: Age 13

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-0.506104	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.058437	GENDER2	SEX (FEMALE)
3	-0.757338	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.329396	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	-0.106764	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.475734	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.264444	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.334031	REGION2	REGION (SOUTHEAST)
9	0.008634	REGION3	REGION (CENTRAL)
10	-0.205949	REGION4	REGION (WEST)
11	0.273782	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.507748	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.693130	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	-0.011754	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.760385	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.782461	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.269945	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.441897	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.193220	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	0.159007	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	-0.137822	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.186209	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.233521	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.359043	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.175012	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.150425	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.174618	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.244380	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.209913	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	0.847664	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	0.252726	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	0.036806	SCH.PRIV	SCHOOL TYPE (PRIVATE)

Table B.12

Estimated Effects for Mathematics Trend Conditioning Variables
1977-78: Age 17

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-0.781467	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.206773	GENDER2	SEX (FEMALE)
3	-0.431460	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.005593	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.134567	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.352374	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.221161	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.066068	REGION2	REGION (SOUTHEAST)
9	0.058216	REGION3	REGION (CENTRAL)
10	-0.042895	REGION4	REGION (WEST)
11	0.084179	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.199708	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.305552	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	-0.040135	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.363890	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.078896	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.178779	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.221519	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	-0.053206	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	-0.285367	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	0.090859	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.174525	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.065219	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.225030	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.140388	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.066370	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.189053	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.140345	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.319494	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	-0.429663	E4 X PE2	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
31	0.506253	E4 X PE3	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
32	0.105962	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
33	-0.038407	SCH.PRIV	SCHOOL TYPE (PRIVATE)
34	0.026481	TV.0-2	TV WATCHING (0-2 HOURS)
35	-0.029427	TV.3-5	TV WATCHING (3-5 HOURS)
36	-0.155838	TV.6+	TV WATCHING (6+ HOURS)
37	-0.205242	HW-NO	HOMEWORK (NONE ASSIGNED)
38	-0.128222	HW-YES	HOMEWORK (YES - SOME AMOUNT)
39	0.045070	HW-2345	HOMEWORK AMOUNT (LINEAR)
40	-0.211903	HOMELNG1	OTHER LANGUAGE AT HOME (OFTEN)
41	-0.060369	HOMELNG2	OTHER LANGUAGE AT HOME (SOMETIMES)
42	-0.087101	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
43	-0.167821	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
44	0.158570	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
45	-0.117209	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)

Table B.12
(continued)

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
46	-0.191573	NMATH1	HIGHEST LEVEL MATH TAKEN (PRE-ALGEBRA)
47	0.228896	NMATH2	HIGHEST LEVEL MATH TAKEN (ALGEBRA)
48	0.682312	NMATH3	HIGHEST LEVEL MATH TAKEN (GEOMETRY)
49	1.029129	NMATH4	HIGHEST LEVEL MATH TAKEN (ALGEBRA-2)
50	1.321908	NMATH5	HIGHEST LEVEL MATH TAKEN (CALCULUS)
51	0.076033	COMPUTER	COMPUTER CLASS TAKEN (YES)

Table B.13

Estimated Effects for Mathematics Trend Conditioning Variables
1981-82: Age 9

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-0.862638	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	0.006737	GENDER2	SEX (FEMALE)
3	-0.363383	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.252489	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.226445	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.497516	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.177121	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.245979	REGION2	REGION (SOUTHEAST)
9	-0.124888	REGION3	REGION (CENTRAL)
10	-0.150039	REGION4	REGION (WEST)
11	0.258322	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.446228	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.451693	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	0.241492	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.875036	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.662891	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.193038	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.315100	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	-0.042492	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	-0.053017	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	0.072069	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.049272	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.220469	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.200338	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.167562	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.138775	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.355953	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.350525	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.300426	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	0.079773	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	-0.048421	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	0.103982	SCH.PRIV	SCHOOL TYPE (PRIVATE)
33	0.648663	TV.0-2	TV WATCHING (0-2 HOURS)
34	0.831681	TV.3-5	TV WATCHING (3-5 HOURS)
35	0.648024	TV.6+	TV WATCHING (6+ HOURS)
36	-0.137906	HOMELNG1	OTHER LANGUAGE AT HOME (OFTEN)
37	0.008072	HOMELNG2	OTHER LANGUAGE AT HOME (SOMETIMES)
38	-0.075129	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
39	-0.142182	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
40	0.332070	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
41	0.156723	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)

Table B.14

Estimated Effects for Mathematics Trend Conditioning Variables
1981-82: Age 13

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-1.256225	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.171860	GENDER2	SEX (FEMALE)
3	-0.654193	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.258215	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.024942	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.410391	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.185483	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.213830	REGION2	REGION (SOUTHEAST)
9	0.031711	REGION3	REGION (CENTRAL)
10	-0.119684	REGION4	REGION (WEST)
11	0.039412	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.243169	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.336603	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	0.048628	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.644180	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.708098	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.158271	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.283477	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.068129	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	-0.097227	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	0.012726	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	0.060793	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.207382	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.177626	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.169596	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.019598	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.043324	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.179968	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.174095	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	0.193170	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	-0.014947	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	0.036300	SCH.PRIV	SCHOOL TYPE (PRIVATE)
33	-0.101233	TV.0-2	TV WATCHING (0-2 HOURS)
34	-0.117255	TV.3-5	TV WATCHING (3-5 HOURS)
35	-0.228167	TV.6+	TV WATCHING (6+ HOURS)
36	0.231025	HW-NO	HOMEWORK (NONE ASSIGNED)
37	0.444984	HW-YES	HOMEWORK (YES - SOME AMOUNT)
38	-0.032439	HW-2345	HOMEWORK AMOUNT (LINEAR)
39	-0.227167	HOMELNG1	OTHER LANGUAGE AT HOME (OFTEN)
40	-0.022530	HOMELNG2	OTHER LANGUAGE AT HOME (SOMETIMES)
41	0.073600	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
42	0.039274	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
43	0.279979	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
44	0.133273	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)
45	0.360884	GRADES	GRADES IN SCHOOL

Table B.15

Estimated Effects for Mathematics Trend Conditioning Variables
1981-82: Age 17

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-1.583301	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.271300	GENDER2	SEX (FEMALE)
3	-0.537188	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.314424	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.274670	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.364567	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.199603	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.027483	REGION2	REGION (SOUTHEAST)
9	0.041125	REGION3	REGION (CENTRAL)
10	-0.090060	REGION4	REGION (WEST)
11	0.104941	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.178396	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.229555	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	-0.056325	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.224271	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.019933	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.068540	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.100033	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.137157	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	0.046145	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	0.153455	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.079989	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.038142	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.037173	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.067290	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.012681	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	0.073736	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	0.002859	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.131598	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	-0.117925	E4 X PE2	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
31	-0.169627	E4 X PE3	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
32	-0.109758	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
33	-0.116926	SCH.PRIV	SCHOOL TYPE (PRIVATE)
34	0.170632	TV.0-2	TV WATCHING (0-2 HOURS)
35	0.101777	TV.3-5	TV WATCHING (3-5 HOURS)
36	0.003121	TV.6+	TV WATCHING (6+ HOURS)
37	0.041748	HW-NO	HOMEWORK (NONE ASSIGNED)
38	0.236337	HW-YES	HOMEWORK (YES - SOME AMOUNT)
39	-0.023902	HW-2345	HOMEWORK AMOUNT (LINEAR)
40	-0.165789	HOMELNG1	OTHER LANGUAGE AT HOME (OFTEN)
41	-0.001730	HOMELNG2	OTHER LANGUAGE AT HOME (SOMETIMES)
42	0.086177	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
43	-0.185237	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
44	0.211456	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
45	-0.050424	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)

Table B.15
(continued)

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
46	-0.125447	NMATH1	HIGHEST LEVEL MATH TAKEN (PRE-ALGEBRA)
47	0.244314	NMATH2	HIGHEST LEVEL MATH TAKEN (ALGEBRA)
48	0.443787	NMATH3	HIGHEST LEVEL MATH TAKEN (GEOMETRY)
49	0.744452	NMATH4	HIGHEST LEVEL MATH TAKEN (ALGEBRA-2)
50	0.929301	NMATH5	HIGHEST LEVEL MATH TAKEN (CALCULUS)
51	0.017961	COMPUTER	COMPUTER CLASS TAKEN (YES)
52	0.221734	GRADES	GRADES IN SCHOOL
53	0.249394	HSPROG2	HIGH SCHOOL PROGRAM (COLLEGE PREP)
54	-0.073426	HSPROG3	HIGH SCHOOL PROGRAM (VOC/TECH)

Table B.16

Estimated Effects for Mathematics Trend Conditioning Variables
1986: Age 9, Bridge A

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-0.725251	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.067436	GENDER2	SEX (FEMALE)
3	-0.011334	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	0.661119	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.091786	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.446555	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.186656	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.087980	REGION2	REGION (SOUTHEAST)
9	0.020318	REGION3	REGION (CENTRAL)
10	-0.176899	REGION4	REGION (WEST)
11	0.434227	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.558842	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.608261	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	0.369200	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.900207	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.662656	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.196782	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.320011	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.060679	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	-0.049282	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	-0.006737	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.430534	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.438015	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.474353	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.393091	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.854606	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.772768	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.794394	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.742478	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	0.220517	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	0.138926	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	0.013411	SCH.PRIV	SCHOOL TYPE (PRIVATE)
33	0.414963	TV.0-2	TV WATCHING (0-2 HOURS)
34	0.491512	TV.3-5	TV WATCHING (3-5 HOURS)
35	0.303934	TV.6+	TV WATCHING (6+ HOURS)
36	-0.322312	HOMELNG1	OTHER LANGUAGE AT HOME (ALWAYS)
37	0.044631	HOMELNG2	OTHER LANGUAGE AT HOME (SOMETIMES)
38	-0.010885	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
39	-0.102755	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
40	0.179859	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
41	-0.083553	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)
42	0.109314	COMPUTER	ARE YOU STUDYING COMPUTERS? (YES)
43	-0.088235	DRACE2	DERIVED RACE (BLACK)
44	-0.240777	DRACE3	DERIVED RACE (HISPANIC)
45	0.271526	DRACE4	DERIVED RACE (ASIAN AMERICAN)

Table B.17

Estimated Effects for Mathematics Trend Conditioning Variables
1986: Age 9, Bridge B

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-1.296606	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	0.052957	GENDER2	SEX (FEMALE)
3	-0.252366	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	0.067568	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.892365	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.782783	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.520928	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.073264	REGION2	REGION (SOUTHEAST)
9	-0.075212	REGION3	REGION (CENTRAL)
10	-0.144994	REGION4	REGION (WEST)
11	0.218180	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.526834	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.475034	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	0.278631	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-1.344181	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.684191	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.235841	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.266246	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	-0.152639	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	-0.197325	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	-0.403283	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.074566	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.140388	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.099987	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.063112	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.112575	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.580280	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.247772	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.228473	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	-0.546176	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	-0.449937	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	-0.055567	SCH.PRIV	SCHOOL TYPE (PRIVATE)
33	0.347712	TV.0-2	TV WATCHING (0-2 HOURS)
34	0.394897	TV.3-5	TV WATCHING (3-5 HOURS)
35	0.215672	TV.6+	TV WATCHING (6+ HOURS)
36	-0.232707	HOMELNG1	OTHER LANGUAGE AT HOME (ALWAYS)
37	0.102350	HOMELNG2	OTHER LANGUAGE AT HOME (SOMETIMES)
38	0.150033	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
39	-0.087639	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
40	0.322346	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
41	-0.065818	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)
42	0.006116	COMPUTER	ARE YOU STUDYING COMPUTERS? (YES)
43	-0.068882	DRACE2	DERIVED RACE (BLACK)
44	-0.165760	DRACE3	DERIVED RACE (HISPANIC)
45	-0.121774	DRACE4	DERIVED RACE (ASIAN AMERICAN)

Table B.18

Estimated Effects for Mathematics Trend Conditioning Variables
1986: Age 13, Bridge A

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-0.968790	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.209290	GENDER2	SEX (FEMALE)
3	-0.452350	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.214310	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.000880	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.479050	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.225560	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.065080	REGION2	REGION (SOUTHEAST)
9	-0.035780	REGION3	REGION (CENTRAL)
10	-0.135580	REGION4	REGION (WEST)
11	-0.031800	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.074200	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.114010	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	-0.162160	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.483090	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.316280	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.090490	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.178190	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.081260	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	0.002940	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	0.219890	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	0.086210	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.033540	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	0.030460	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	0.251810	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.052030	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	0.130550	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.097660	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.038730	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	0.219560	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	0.175790	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	-0.087090	SCH.PRIV	SCHOOL TYPE (PRIVATE)
33	-0.523890	TV.0-2	TV WATCHING (0-2 HOURS)
34	-0.502250	TV.3-5	TV WATCHING (3-5 HOURS)
35	-0.689270	TV.6+	TV WATCHING (6+ HOURS)
36	-0.059210	HW-NO	HOMEWORK (NONE ASSIGNED)
37	0.115340	HW-YES	HOMEWORK (YES - SOME AMOUNT)
38	-0.023640	HW-2345	HOMEWORK AMOUNT (LINEAR)
39	-0.189330	HOMELNG1	OTHER LANGUAGE AT HOME (MOSTLY, ALWAYS)
40	0.075950	HOMELNG2	OTHER LANGUAGE AT HOME (OCCASIONALLY, 1/2 TIME)
41	0.028270	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
42	0.061320	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
43	0.159450	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
44	0.136840	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)
45	0.359350	GRADES	GRADES IN SCHOOL

Table B.18
(continued)

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
46	0.455550	TMATH2	TYPE OF MATH CLASS (REGULAR MATH)
47	0.645330	TMATH3	TYPE OF MATH CLASS (PRE-ALGEBRA)
48	0.898040	TMATH45	TYPE OF MATH CLASS (ALGEBRA, OTHER)
49	-0.003550	COMPUTER	ARE YOU STUDYING COMPUTERS? (YES)
50	-0.038190	DRACE2	DERIVED RACE (BLACK)
51	-0.181510	DRACE3	DERIVED RACE (HISPANIC)
52	0.258680	DRACE4	DERIVED RACE (ASIAN AMERICAN)

Table B.19

Estimated Effects for Mathematics Trend Conditioning Variables
1986: Age 13, Bridge B

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-2.314038	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.217852	GENDER2	SEX (FEMALE)
3	-0.495203	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	0.479798	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.159407	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.272203	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.159015	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.200327	REGION2	REGION (SOUTHEAST)
9	-0.130221	REGION3	REGION (CENTRAL)
10	-0.290191	REGION4	REGION (WEST)
11	-0.026075	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.155467	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.207214	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	0.088771	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.640996	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	0.231757	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.169866	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.239980	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.130466	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	-0.101624	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	-0.481779	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	0.062448	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	0.129460	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.101520	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	0.057715	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	-0.187339	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	-0.114956	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	-0.346426	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	-0.231446	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	0.436624	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
31	0.427622	E4 X PE_	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
32	0.163995	SCH.PRIV	SCHOOL TYPE (PRIVATE)
33	0.885902	TV.0-2	TV WATCHING (0-2 HOURS)
34	0.834638	TV.3-5	TV WATCHING (3-5 HOURS)
35	0.734312	TV.6+	TV WATCHING (6+ HOURS)
36	0.036860	HW-NO	HOMEWORK (NONE ASSIGNED)
37	0.131824	HW-YES	HOMEWORK (YES - SOME AMOUNT)
38	-0.001523	HW-2345	HOMEWORK AMOUNT (LINEAR)
39	-0.327862	HOMELNG1	OTHER LANGUAGE AT HOME (MOSTLY, ALWAYS)
40	0.037094	HOMELNG2	OTHER LANGUAGE AT HOME (OCCASIONALLY, 1/2 TIME)
41	0.331032	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
42	0.075593	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
43	0.246166	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
44	0.051226	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)
45	0.380695	GRADES	GRADES IN SCHOOL

Table B.19
(continued)

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
46	0.299062	TMATH2	TYPE OF MATH CLASS (REGULAR MATH)
47	0.530130	TMATH3	TYPE OF MATH CLASS (PRE-ALGEBRA)
48	0.373462	TMATH45	TYPE OF MATH CLASS (ALGEBRA, OTHER)
49	0.038474	COMPUTER	ARE YOU STUDYING COMPUTERS? (YES)
50	-0.195711	DRACE2	DERIVED RACE (BLACK)
51	-0.416190	DRACE3	DERIVED RACE (HISPANIC)
52	-0.144319	DRACE4	DERIVED RACE (ASIAN AMERICAN)

Table B.20

Estimated Effects for Mathematics Trend Conditioning Variables
1986: Age 17

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
1	-2.485863	OVERALL	OVERALL CONSTANT '1' FOR EVERYONE
2	-0.203894	GENDER2	SEX (FEMALE)
3	0.124491	ETHNIC2	OBSERVED ETHNICITY (BLACK)
4	-0.431167	ETHNIC3	OBSERVED ETHNICITY (HISPANIC)
5	0.212997	ETHNIC4	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	0.413316	STOC2	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	0.352628	STOC3	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	-0.005895	REGION2	REGION (SOUTHEAST)
9	0.019766	REGION3	REGION (CENTRAL)
10	-0.045038	REGION4	REGION (WEST)
11	0.030552	PARED2	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	0.101183	PARED3	PARENTS EDUCATION (POST HIGH SCHOOL)
13	0.121523	PARED4	PARENTS EDUCATION (COLLEGE GRAD)
14	-0.060429	PARED_	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	-0.205362	< MODALG	MODAL GRADE (LESS THAN MODAL GRADE)
16	-0.061003	> MODALG	MODAL GRADE (GREATER THAN MODAL GRADE)
17	0.018149	HOMEITM3	ARTICLES IN HOME (YES TO 3)
18	0.053439	HOMEITM4	ARTICLES IN HOME (YES TO 4)
19	0.053462	E2 X SEX	ETHNICITY BY GENDER (BLACK FEMALE)
20	0.096039	E3 X SEX	ETHNICITY BY GENDER (HISPANIC FEMALE)
21	-0.172182	E4 X SEX	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
22	-0.045511	E2 X PE2	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
23	-0.019722	E2 X PE3	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
24	-0.025977	E2 X PE4	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
25	-0.026264	E2 X PE_	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
26	0.241818	E3 X PE2	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
27	0.249675	E3 X PE3	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
28	0.296959	E3 X PE4	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
29	0.009964	E3 X PE_	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
30	-0.231579	E4 X PE2	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
31	0.203965	E4 X PE3	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
32	0.062122	E4 X PE4	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
33	-0.090388	SCH.PRIV	SCHOOL TYPE (PRIVATE)
34	1.027634	TV.0-2	TV WATCHING (0-2 HOURS)
35	0.972085	TV.3-5	TV WATCHING (3-5 HOURS)
36	0.815760	TV.6+	TV WATCHING (6+ HOURS)
37	-0.088868	HW-NO	HOMEWORK (NONE ASSIGNED)
38	0.258237	HW-YES	HOMEWORK (YES - SOME AMOUNT)
39	-0.079234	HW-2345	HOMEWORK AMOUNT (LINEAR)
40	-0.077022	HOMELNG1	OTHER LANGUAGE AT HOME (MOSTLY, ALWAYS)
41	0.028441	HOMELNG2	OTHER LANGUAGE AT HOME (OCCASIONALLY, 1/2 TIME)
42	0.063506	HL2 X E2	HOME LANG BY ETHNICITY (OFTEN, BLACK)
43	0.034244	HL1 X E2	HOME LANG BY ETHNICITY (SOMETIMES, BLACK)
44	0.399629	HL2 X E3	HOME LANG BY ETHNICITY (OFTEN, HISPANIC)
45	0.294080	HL1 X E3	HOME LANG BY ETHNICITY (SOMETIMES, HISPANIC)

Table B.20
(continued)

	ESTIMATED EFFECT	VARIABLE LABEL	DESCRIPTION
46	-0.134802	NMATH1	HIGHEST LEVEL MATH TAKEN (PRE-ALGEBRA)
47	0.097243	NMATH2	HIGHEST LEVEL MATH TAKEN (ALGEBRA)
48	0.324996	NMATH3	HIGHEST LEVEL MATH TAKEN (GEOMETRY)
49	0.689081	NMATH4	HIGHEST LEVEL MATH TAKEN (ALGEBRA-2)
50	1.223782	NMATH5	HIGHEST LEVEL MATH TAKEN (CALCULUS)
51	0.020003	COMPUTER	COMPUTER CLASS TAKEN (YES)
52	0.292099	GRADES	GRADES IN SCHOOL
53	0.226475	HSPROG2	HIGH SCHOOL PROGRAM (COLLEGE PREP)
54	-0.056057	HSPROG3	HIGH SCHOOL PROGRAM (VOC/TECH)
55	-0.531790	DRACE2	DERIVED RACE (BLACK)
56	-0.345698	DRACE3	DERIVED RACE (HISPANIC)
57	-0.125825	DRACE4	DERIVED RACE (ASIAN AMERICAN)

Table B.21

Science Conditioning Variables, Grade 3/Age 9

	VARIABLE LABEL		DESCRIPTION
1	OVERALL	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	2	SEX (FEMALE)
3	ETHNIC2	3	ETHNICITY (BLACK)
4	ETHNIC3	4	ETHNICITY (HISPANIC)
5	ETHNIC4	5	ETHNICITY (ASIAN AMERICAN)
6	STOC2	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	8	REGION (SOUTHEAST)
9	REGION3	9	REGION (CENTRAL)
10	REGION4	10	REGION (WEST)
11	PARED2	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	15	ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	16	ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	17	HOURS TV WATCHING (LINEAR)
18	TV**2	18	HOURS TV WATCHING (QUADRATIC)
19	HW-YES	19	HOMEWORK (YES - SOME AMOUNT)
20	HW-2345	20	HOMEWORK AMOUNT (LINEAR)
21	LM BY E3	21	LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
22	LM BY E4	22	LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
23	LM BY E_	23	LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
24	LUNCH%	24	PERCENT IN LUNCH PROGRAM
25	LUNCH_	25	LUNCH PROGRAM (MISSING)
26	%WHITE49	26	PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
27	%WHITE79	27	PERCENT WHITE IN SCHOOL (50-79% INTEGRATED)
	%WHITE00	28	PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
28	E2 X SEX	29	ETHNICITY BY GENDER (BLACK FEMALE)
29	E3 X SEX	30	ETHNICITY BY GENDER (HISPANIC FEMALE)
30	E4 X SEX	31	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
31	E2 X PE2	32	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
32	E2 X PE3	33	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
33	E2 X PE4	34	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
34	E2 X PE_	35	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
35	E3 X PE2	36	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
36	E3 X PE3	37	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
37	E3 X PE4	38	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
38	E3 X PE_	39	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
	E4 X PE2	40	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
39	E4 X PE3	41	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
40	E4 X PE4	42	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
41	E4 X PE_	43	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)
42	MA,<MG	44	MODAL AGE, LESS THAN MODAL GRADE

Table B.21
(continued)

	VARIABLE LABEL	DESCRIPTION
43	MA,MG	45 MODAL AGE, MODAL GRADE, MISSING
44	MA,>MG	46 MODAL AGE, GREATER THAN MODAL GRADE
45	>MA,MG	47 GREATER THAN MODAL AGE, MODAL GRADE
46	SCH TYPE	48 SCHOOL TYPE (NOT PUBLIC)
47	ASK SW?	49 FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
48	PRESCH1	50 WENT TO PRESCHOOL (YES)
49	#PARENT1	51 SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
50	MOTHER	52 MOTHER AT HOME
51	MOWORK	53 MOTHER WORKS OUTSIDE (YES)
52	SCI123	54 SPENT AT LEAST ONCE A WEEK STUDYING SCIENCE
53	SCI45	55 SPENT < ONCE A WEEK OR NEVER STUDYING SCIENCE
54	COMPUTER	56 USE COMPUTERS FOR MATH, READING, ETC. (YES)
55	SUPERVIS	57 ADULT SUPERVISION OF STUDENT AFTER SCHOOL(YES)
56	MATH Q1	58 MATH QUANTILE (LINEAR -1,0,1)
57	SCI Q1	59 SCIENCE QUANTILE (LINEAR -1,0,1)

Table B.22

Estimated Effects for Science Conditioning Variables, Grade 3/Age 9

	SUBSCALE 1	SUBSCALE 3	SUBSCALE 6
1	-1.027950	-1.539603	-0.411865
2	-0.036995	0.034485	-0.324613
3	0.004488	-0.220916	-0.298918
4	-0.046322	-0.253478	-0.148369
5	-0.512803	0.493381	0.639191
6	0.317467	0.165716	0.231756
7	0.195622	0.106610	0.173982
8	-0.051878	0.049463	0.023004
9	-0.058628	0.014442	-0.037485
10	-0.099356	0.006751	0.061045
11	0.209816	0.033078	0.202342
12	0.418804	0.311525	0.394688
13	0.371804	0.320744	0.347548
14	0.228783	0.271383	0.135759
15	0.052308	0.070849	0.111309
16	0.081124	0.228607	0.170024
17	0.078107	0.235255	0.216679
18	-0.014847	-0.032669	-0.034084
19	0.078969	-0.076431	0.112195
20	-0.001100	-0.027368	-0.021323
21	0.090482	0.152099	0.185703
22	0.099780	0.127217	0.040464
23	-0.133542	-0.152438	-0.230931
24	-0.259334	-0.166585	-0.382387
25	-0.137761	-0.072979	-0.158428
26	-0.141557	-0.134732	-0.198346
27	-0.028554	-0.066428	-0.108059
28	0.092295	0.008121	0.106356
29	0.107580	0.099879	-0.055230
30	0.312742	-0.301925	-0.162949
31	-0.336560	-0.108481	-0.399386
32	-0.479056	-0.371290	-0.380324
33	-0.345508	-0.209929	-0.205010
34	-0.311267	-0.236645	-0.136088
35	-0.174188	-0.054116	-0.390267
36	-0.255924	-0.261684	-0.282314
37	-0.287467	-0.240709	-0.287834
38	-0.226640	-0.167789	-0.100105
39	0.383161	-1.628189	-1.164638
40	0.150046	-1.295492	-1.460198
41	0.440562	-0.886048	-0.438206
42	0.050570	-0.759013	-0.815707
43	-0.468759	-0.652030	-0.636868
44	0.105295	-0.003158	0.035390

Table B.22
(continued)

	SUBSCALE 1	SUBSCALE 3	SUBSCALE 6
45	0.314602	0.128585	0.272590
46	-0.035222	-0.168017	-0.225379
47	-0.070884	-0.131958	-0.151235
48	-0.034763	-0.005629	-0.070424
49	0.144045	0.082908	0.120839
50	0.147113	0.137197	0.067721
51	0.052701	0.059180	0.198927
52	-0.038439	0.029265	0.002207
53	-0.258651	0.263742	-0.051063
54	-0.385471	0.166218	-0.213505
55	0.033335	0.039578	0.043706
56	0.065488	0.118883	0.100908
57	-0.280087	-0.249134	-0.327255

Table B.23

Science Conditioning Variables, Grade 7/Age 13

	VARIABLE LABEL		DESCRIPTION
1	OVERALL	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	2	SEX (FEMALE)
3	ETHNIC2	3	ETHNICITY (BLACK)
4	ETHNIC3	4	ETHNICITY (HISPANIC)
5	ETHNIC4	5	ETHNICITY (ASIAN AMERICAN)
6	STOC2	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	8	REGION (SOUTHEAST)
9	REGION3	9	REGION (CENTRAL)
10	REGION4	10	REGION (WEST)
11	PARED2	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	15	ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	16	ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	17	HOURS TV WATCHING (LINEAR)
18	TV**2	18	HOURS TV WATCHING (QUADRATIC)
19	HW-NO	19	HOMEWORK (DON'T HAVE ANY)
20	HW-YES	20	HOMEWORK (YES - SOME AMOUNT)
21	HW-2345	21	HOMEWORK AMOUNT (LINEAR)
22	LM BY E3	22	LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
23	LM BY E4	23	LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
24	LM BY E_	24	LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
25	LUNCH%	25	PERCENT IN LUNCH PROGRAM
26	LUNCH_	26	LUNCH PROGRAM (MISSING)
27	%WHITE49	27	PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
28	%WHITE79	28	PERCENT WHITE IN SCHOOL (50%-79%)
	%WHITE00	29	PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
29	E2 X SEX	30	ETHNICITY BY GENDER (BLACK FEMALE)
30	E3 X SEX	31	ETHNICITY BY GENDER (HISPANIC FEMALE)
31	E4 X SEX	32	ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
32	E2 X PE2	33	ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
33	E2 X PE3	34	ETHNICITY BY PARENT'S ED (BLACK, POST HS)
34	E2 X PE4	35	ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
35	E2 X PE_	36	ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
36	E3 X PE2	37	ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
37	E3 X PE3	38	ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
38	E3 X PE4	39	ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
39	E3 X PE_	40	ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
40	E4 X PE2	41	ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
41	E4 X PE3	42	ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
42	E4 X PE4	43	ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
43	E4 X PE_	44	ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)

Table B.23
(continued)

	VARIABLE LABEL		DESCRIPTION
44	MA,<MG	45	MODAL AGE, LESS THAN MODAL GRADE
45	MA,MG	46	MODAL AGE, MODAL GRADE, MISSING
46	MA,>MG	47	MODAL AGE, GREATER THAN MODAL GRADE
47	>MA,MG	48	GREATER THAN MODAL AGE, MODAL GRADE
48	SCH TYPE	49	SCHOOL TYPE (NOT PUBLIC)
49	ASK SW?	50	FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
50	PRESCH1	51	WENT TO PRESCHOOL (YES)
51	#PARENT1	52	SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
52	MOTHER	53	MOTHER AT HOME
53	MOWORK	54	MOTHER WORKS OUTSIDE (YES)
54	COMPUTER	55	USE COMPUTERS FOR MATH, READING, ETC. (YES)
55	MATH2	56	TYPE OF MATH CLASS(REGULAR MATH)
56	MATH3	57	TYPE OF MATH CLASS(PRE-ALGEBRA)
57	MATH45	58	TYPE OF MATH CLASS(ALGEBRA)
58	SCIENCE2	59	STUDYING IN SCIENCE THIS YEAR (LIFE SCIENCE)
59	SCIENCE3	60	STUDYING IN SCIENCE THIS YEAR (PHYSICAL SCIENCE)
60	SCIENCE4	61	STUDYING IN SCIENCE THIS YEAR (EARTH SCIENCE)
61	SCIENCE5	62	STUDYING IN SCIENCE THIS YEAR (GENERAL SCIENCE)
62	GRADES	63	GRADES IN SCHOOL (LINEAR)
63	MATH Q1	64	MATH QUANTILE (LINEAR -1,0,1)
64	SCI Q1	65	SCIENCE QUANTILE (LINEAR -1,0,1)

Table B.24

Estimated Effects for Science Conditioning Variables, Grade 7/Age 13

	SUBSCALE 1	SUBSCALE 2	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5
1	-0.921900	-0.728416	-0.964766	-0.403002	-1.045989
2	-0.188817	-0.289175	-0.024590	-0.526984	-0.298524
3	-0.344867	-0.609363	-0.174167	-0.326886	-0.870624
4	-0.278339	-0.327569	-0.227757	-0.063358	-0.233576
5	-1.058032	-1.822311	0.789686	-1.016836	0.330024
6	0.160177	0.145207	0.004400	0.087345	0.145490
7	0.095899	0.068574	0.013040	0.118676	0.100085
8	0.029778	-0.017066	-0.015193	-0.049297	0.019044
9	0.057041	0.026123	0.062015	0.041668	0.102655
10	-0.033711	-0.067379	-0.032482	-0.047574	0.011705
11	0.029428	-0.054719	0.093961	0.102967	0.071009
12	0.176754	0.151999	0.197954	0.223748	0.241014
13	0.194384	0.101753	0.232376	0.214939	0.296519
14	-0.044960	-0.063955	0.086042	0.039230	0.059112
15	0.085018	0.038272	0.063404	0.153887	0.121538
16	0.094808	0.104775	0.095784	0.156526	0.161213
17	0.080265	0.040780	0.144271	0.053809	0.087588
18	-0.013240	-0.006388	-0.021666	-0.010680	-0.017068
19	0.036270	-0.210399	-0.041576	-0.490439	-0.078815
20	0.100315	-0.227302	0.053470	-0.428770	-0.170859
21	0.007153	0.013630	0.026170	-0.018446	0.020861
22	-0.125860	0.019754	0.025339	-0.043756	-0.023216
23	-0.225117	-0.352867	-0.321131	-0.125152	-0.625920
24	0.035864	-0.040543	-0.069561	0.125382	0.002168
25	-0.029924	-0.206254	-0.059946	0.024705	-0.032774
26	-0.029282	-0.183671	-0.066899	-0.008394	-0.030263
27	-0.176457	-0.144600	-0.113581	-0.244936	-0.240365
28	-0.031899	-0.064580	-0.013255	-0.036387	-0.040290
29	0.034209	0.121098	-0.060865	-0.013686	0.072926
30	0.075908	0.176640	-0.013788	0.027655	0.102128
31	0.202159	-0.175074	-0.530370	-0.266771	-0.102259
32	0.037020	0.134764	-0.139545	-0.119350	0.488599
33	0.125354	0.062806	-0.026240	0.079002	0.788805
34	-0.028683	0.133492	-0.116936	-0.137285	0.385568
35	0.022668	0.019560	-0.181972	-0.094152	0.491215
36	0.096676	-0.280242	-0.026605	0.033987	0.088311
37	0.140235	-0.005111	0.133751	-0.068758	-0.116907
38	-0.071345	-0.151671	-0.057318	-0.088970	-0.198102
39	0.216444	-0.047763	-0.031577	-0.022252	-0.032317
40	1.187678	2.276199	-0.795834	0.792370	-0.362707
41	0.900998	1.792808	-0.384851	1.839425	-0.510366
42	1.264378	2.124688	-0.732842	1.537907	0.112796
43	1.105844	2.423252	-0.545686	1.579802	-0.025581
44	-0.406121	-0.436965	-0.429181	-0.448541	-0.552704

Table B.24
(continued)

	SUBSCALE 1	SUBSCALE 2	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5
45	-0.010292	-0.054944	-0.070840	-0.090188	-0.137412
46	0.301273	0.088229	0.099190	0.352348	0.174274
47	-0.181314	-0.265747	-0.270989	-0.232510	-0.313463
48	-0.020186	0.013735	0.012268	-0.071327	0.017841
49	-0.032842	-0.081746	-0.063706	-0.085566	0.011082
50	0.049921	0.048095	0.055173	0.053287	0.017543
51	0.060310	-0.005693	0.008395	-0.021667	0.066283
52	0.061615	-0.061938	-0.013836	-0.009469	0.011801
53	-0.026106	-0.019550	-0.001362	-0.070962	-0.066507
54	-0.101173	-0.074390	-0.110376	-0.066353	-0.089433
55	-0.130518	0.083639	0.017161	0.178218	0.101881
56	0.008173	0.276039	0.229248	0.326113	0.290042
57	-0.102004	0.236990	0.001423	0.264171	0.162667
58	0.256450	0.224210	0.171521	0.161651	0.197056
59	0.091923	0.214919	0.206680	0.139448	0.144136
60	0.147674	0.184529	0.147927	0.139468	0.091654
61	0.269343	0.304336	0.237593	0.247061	0.288282
62	0.252771	0.231289	0.224300	0.186930	0.285746
63	-0.260643	-0.212966	-0.291113	-0.294428	-0.280580
64	-0.135874	-0.179473	-0.186960	-0.060628	-0.128474

Table B.25

Science Conditioning Variables, Grade 11/Age 17

	VARIABLE LABEL	DESCRIPTION
1	OVERALL	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	2 SEX (FEMALE)
3	ETHNIC2	3 ETHNICITY (BLACK)
4	ETHNIC3	4 ETHNICITY (HISPANIC)
5	ETHNIC4	5 ETHNICITY (ASIAN AMERICAN)
6	STOC2	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	8 REGION (SOUTHEAST)
9	REGION3	9 REGION (CENTRAL)
10	REGION4	10 REGION (WEST)
11	PARED2	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	ITEMS2	15 ITEMS IN HOME (FOUR OF THE FIVE)
16	ITEMS3	16 ITEMS IN HOME (FIVE OF THE FIVE)
17	TV	17 HOURS TV WATCHING (LINEAR)
18	TV**2	18 HOURS TV WATCHING (QUADRATIC)
19	HW-NO	19 HOMEWORK (DON'T HAVE ANY)
20	HW-YES	20 HOMEWORK (YES - SOME AMOUNT)
21	HW-2345	21 HOMEWORK AMOUNT (LINEAR)
22	LM BY E3	22 LANGUAGE MINORITY BY ETHNICITY (YES, HISPANIC)
23	LM BY E4	23 LANGUAGE MINORITY BY ETHNICITY (YES, ASIAN AMER)
24	LM BY E_	24 LANGUAGE MINORITY BY ETHNICITY (YES, OTHER ETH)
25	LUNCH%	25 PERCENT IN LUNCH PROGRAM
26	LUNCH_	26 LUNCH PROGRAM (MISSING)
27	%WHITE49	27 PERCENT WHITE IN SCHOOL (0-49% WHITE MINORITY)
28	%WHITE79	28 PERCENT WHITE IN SCHOOL (50-79% INTEGRATED)
	%WHITE00	29 PERCENT WHITE IN SCHOOL (80-100% PREDOMINANTLY)
29	E2 X SEX	30 ETHNICITY BY GENDER (BLACK FEMALE)
30	E3 X SEX	31 ETHNICITY BY GENDER (HISPANIC FEMALE)
31	E4 X SEX	32 ETHNICITY BY GENDER (ASIAN AMERICAN FEMALE)
32	E2 X PE2	33 ETHNICITY BY PARENT'S ED (BLACK, HS GRAD)
33	E2 X PE3	34 ETHNICITY BY PARENT'S ED (BLACK, POST HS)
34	E2 X PE4	35 ETHNICITY BY PARENT'S ED (BLACK, COLLEGE GRAD)
35	E2 X PE_	36 ETHNICITY BY PARENT'S ED (BLACK, UNKNOWN)
36	E3 X PE2	37 ETHNICITY BY PARENT'S ED (HISPANIC, HS GRAD)
37	E3 X PE3	38 ETHNICITY BY PARENT'S ED (HISPANIC, POST HS)
38	E3 X PE4	39 ETHNICITY BY PARENT'S ED (HISPANIC, COLLEGE)
39	E3 X PE_	40 ETHNICITY BY PARENT'S ED (HISPANIC, UNKNOWN)
40	E4 X PE2	41 ETHNICITY BY PARENT'S ED (ASIAN AMER, HS GRAD)
41	E4 X PE3	42 ETHNICITY BY PARENT'S ED (ASIAN AMER, POST HS)
42	E4 X PE4	43 ETHNICITY BY PARENT'S ED (ASIAN AMER, COLL GRAD)
43	E4 X PE_	44 ETHNICITY BY PARENT'S ED (ASIAN AMER, UNKNOWN)

Table B.25
(continued)

	VARIABLE LABEL		DESCRIPTION
44	MA,<MG	45	MODAL AGE, LESS THAN MODAL GRADE
45	MA,MG	46	MODAL AGE, MODAL GRADE, MISSING
46	MA,>MG	47	MODAL AGE, GREATER THAN MODAL GRADE
47	>MA,MG	48	GREATER THAN MODAL AGE, MODAL GRADE
48	SCH TYPE	49	SCHOOL TYPE (NOT PUBLIC)
49	ASK SW?	50	FAMILY ASKS ABOUT SCHOOLWORK (ALMOST EVERY DAY)
50	PRESCH1	51	WENT TO PRESCHOOL (YES)
51	#PARENT1	52	SINGLE/MULTIPLE PARENT HOME (MOTHER,FATHER HOME)
52	MOTHER	53	MOTHER AT HOME
53	MOWORK	54	MOTHER WORKS OUTSIDE (YES)
54	GRADES	55	GRADES IN SCHOOL (LINEAR)
55	PROGRAM2	56	HIGH SCHOOL PROGRAM(COLLEGE PREPARATORY)
56	PROGRAM3	57	HIGH SCHOOL PROGRAM(VOCATIONAL)
57	MATH	58	NUMBER OF MATH COURSES
58	SCIENCE	59	NUMBER OF SCIENCE COURSES
59	POSTSEC2	60	TWO-YEAR COLLEGE
60	POSTSEC3	61	FOUR-YEAR COLLEGE
61	HRS WORK	62	HOURS OF OUTSIDE WORK
62	ENGL23	63	TYPES OF ENGLISH CLASS(ADVANCED&COLLEGE PREP.)
63	ENGLISH5	64	TYPES OF ENGLISH CLASS(REMEDIAL)
64	MATH Q1	65	MATH QUANTILE (LINEAR -1,0,1)
65	SCI Q1	66	SCIENCE QUANTILE (LINEAR -1,0,1)

Table B.26

Estimated Effects for Science Conditioning Variables, Grade 11/Age 17

	SUBSCALE 1	SUBSCALE 2	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5
1	0.043593	0.063372	0.106473	0.352457	-0.231871
2	-0.161091	-0.289228	-0.099476	-0.716864	-0.460884
3	-0.362475	-0.338893	-0.173738	-0.620345	-0.432612
4	-0.230492	-0.553346	-0.453106	-0.383723	0.004074
5	0.257795	0.697624	-0.327383	-0.135944	0.107313
6	0.181303	0.155107	0.141684	0.207503	0.253035
7	0.096863	0.059891	0.029983	0.038749	0.158398
8	-0.011213	0.047387	0.017864	0.015855	-0.005260
9	-0.004681	0.027787	0.082975	0.007021	0.075262
10	0.020535	-0.066603	0.030213	0.049925	0.071285
11	0.072452	-0.066689	-0.064837	-0.055517	0.161335
12	0.179656	0.031182	0.005316	0.063548	0.265283
13	0.149746	0.034793	0.079944	0.106435	0.240836
14	-0.022815	-0.186059	-0.092720	0.085932	0.302199
15	0.131464	0.142492	0.106207	0.094887	0.129853
16	0.124030	0.134147	0.123985	0.114555	0.156846
17	-0.001005	-0.082887	-0.028116	-0.038275	-0.041108
18	-0.004810	0.006694	-0.002735	0.000991	0.000820
19	-0.108159	-0.699705	-0.340852	-0.523118	-0.079568
20	-0.007321	-0.596946	-0.197045	-0.458036	-0.056911
21	-0.009901	-0.002791	-0.010068	-0.027996	0.009185
22	-0.159796	0.179664	0.004145	0.048460	-0.213472
23	-0.124145	-0.547254	0.023533	-0.316701	-0.044378
24	0.144437	-0.232710	-0.081140	-0.010936	0.149002
25	-0.232195	-0.111559	-0.039114	-0.001650	-0.198142
26	-0.001776	0.019039	-0.020661	-0.029408	-0.054646
27	-0.069033	-0.124319	-0.079437	-0.088034	-0.073965
28	-0.014637	-0.000283	0.003928	-0.024071	0.030897
29	0.032172	-0.048967	0.132354	0.195481	0.059742
30	0.169771	0.171371	0.215543	0.141315	0.245622
31	-0.311658	-0.486529	0.106844	-0.457785	0.166015
32	-0.128565	-0.165027	-0.153785	-0.012574	-0.176237
33	-0.040215	-0.121918	-0.110535	-0.107906	-0.213731
34	-0.106096	-0.105798	-0.210725	0.024428	-0.075922
35	0.037949	0.049074	-0.386862	-0.077424	-0.222369
36	-0.085326	0.102463	0.126362	-0.133838	-0.422317
37	-0.001074	0.332671	0.180225	-0.024222	-0.299538
38	-0.119561	-0.051860	0.131508	-0.004487	-0.171454
39	0.046925	0.202801	0.344202	-0.172031	-0.488798
40	-0.292711	-0.706969	0.148923	0.220247	-0.969625
41	-0.138596	-0.565604	0.149780	-0.231619	-0.312820
42	-0.045111	-0.370719	0.320102	0.355094	-0.221272
43	-0.789749	-0.553608	0.192032	-0.320634	-0.824142
44	-0.141423	-0.195838	-0.267417	-0.184574	-0.115384

Table B.26
(continued)

	SUBSCALE 1	SUBSCALE 2	SUBSCALE 3	SUBSCALE 4	SUBSCALE 5
45	-0.006500	-0.051797	-0.051633	0.007075	0.039927
46	-0.013307	-0.100688	-0.018166	0.038639	-0.053074
47	-0.173344	-0.219757	-0.222941	-0.102418	-0.100814
48	-0.111604	-0.130452	-0.115449	-0.179906	-0.111902
49	-0.039574	-0.046300	-0.025739	-0.017585	-0.048514
50	0.003232	0.108885	-0.004211	-0.009670	-0.002218
51	0.021146	-0.014706	0.027883	-0.024738	-0.027867
52	-0.060182	-0.100502	-0.105426	0.016892	0.039096
53	-0.008129	-0.036518	0.004197	-0.032206	-0.040905
54	0.137860	0.222743	0.213212	0.150295	0.156734
55	0.165642	0.138009	0.135968	0.134767	0.152624
56	-0.008978	0.001769	-0.023027	0.066621	-0.009418
57	0.059011	0.100075	0.095915	0.103744	0.084779
58	0.084300	0.216691	0.096578	0.108890	0.100083
59	-0.015932	0.011491	0.008584	-0.041987	-0.024621
60	0.092601	0.191483	0.087915	0.013643	0.086432
61	-0.002879	-0.058677	-0.078214	-0.045114	-0.017600
62	0.091970	0.133598	0.074131	0.053897	0.014220
63	-0.261116	-0.286074	-0.079385	-0.087793	-0.274558
64	-0.221969	-0.157411	-0.284129	-0.281330	-0.252945
65	-0.226724	-0.321484	-0.280146	-0.270467	-0.255174

Table B.27

Estimated Effects for Science Trend Conditioning Variables
1976-77: Age 9

	VARIABLE LABEL	GAMMA		DESCRIPTION
1	OVERALL	-0.582386	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.113465	2	SEX (FEMALE)
3	ETHNIC2	-1.027636	3	OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.588893	4	OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.365009	5	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.732791	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.404707	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.167073	8	REGION (SOUTHEAST)
9	REGION3	0.110589	9	REGION (CENTRAL)
10	REGION4	0.098635	10	REGION (WEST)
11	PARED2	0.290650	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.498876	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.402642	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.121465	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.614894	15	MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.454198	16	MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.215899	17	ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.482111	18	ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	0.133647	19	SCHOOL TYPE (PRIVATE)

Table B.28

Estimated Effects for Science Trend Conditioning Variables 1976-77: Age 13

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-0.757367	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.201317	2 SEX (FEMALE)
3	ETHNIC2	-0.776877	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.533988	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.218238	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.333642	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.164775	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.204287	8 REGION (SOUTHEAST)
9	REGION3	-0.034224	9 REGION (CENTRAL)
10	REGION4	-0.111973	10 REGION (WEST)
11	PARED2	0.185109	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.433452	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.483972	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	-0.033020	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.537162	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.593768	16 MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.179763	17 ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.414808	18 ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	0.162110	19 SCHOOL TYPE (PRIVATE)
	SCH.MISS		20 SCHOOL TYPE (MISSING)

Table B.29

Estimated Effects for Science Trend Conditioning Variables
1976-77: Age 17

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	0.182453	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.378367	2 SEX (FEMALE)
3	ETHNIC2	-0.905608	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.341533	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.076071	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.158816	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.066231	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.128876	8 REGION (SOUTHEAST)
9	REGION3	-0.026421	9 REGION (CENTRAL)
10	REGION4	-0.107374	10 REGION (WEST)
11	PARED2	0.132593	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.306682	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.529397	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	-0.084897	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.650818	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.164101	16 MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.298438	17 ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.484623	18 ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	0.084481	19 SCHOOL TYPE (PRIVATE)
	SCH.MISS		20 SCHOOL TYPE (MISSING)

Table B.30

Estimated Effects for Science Trend Conditioning Variables
1981-82: Age 9

	VARIABLE LABEL	ESTIMATED EFFECT		DESCRIPTION
1	OVERALL	-0.144616	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.050074	2	SEX (FEMALE)
3	ETHNIC2	-0.873223	3	OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.831362	4	OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.352724	5	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.519993	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.165222	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.007397	8	REGION (SOUTHEAST)
9	REGION3	0.012891	9	REGION (CENTRAL)
10	REGION4	-0.047799	10	REGION (WEST)
11	PARED2	0.329554	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.467062	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.514058	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.174065	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.702701	15	MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.723683	16	MODAL GRADE (GREATER THAN MODAL GRADE)
	HOMEITM3		17	ARTICLES IN HOME (YES TO 3)
	HOMEITM4		18	ARTICLES IN HOME (YES TO 4)
17	SCH.PRIV	-0.051738	19	SCHOOL TYPE (PRIVATE)

Table B.31

Estimated Effects for Science Trend Conditioning Variables
1981-82: Age 13

	VARIABLE LABEL	ESTIMATED EFFECT		DESCRIPTION
1	OVERALL	-0.560294	1	OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.268114	2	SEX (FEMALE)
3	ETHNIC2	-0.709938	3	OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.496880	4	OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.009130	5	OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.474841	6	SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.194103	7	SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.125149	8	REGION (SOUTHEAST)
9	REGION3	0.038679	9	REGION (CENTRAL)
10	REGION4	0.002386	10	REGION (WEST)
11	PARED2	0.228734	11	PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.513646	12	PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.582109	13	PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.064964	14	PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.603198	15	MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.848736	16	MODAL GRADE (GREATER THAN MODAL GRADE)
	HOMEITM3		17	ARTICLES IN HOME (YES TO 3)
	HOMEITM4		18	ARTICLES IN HOME (YES TO 4)
17	SCH.PRIV	0.071106	19	SCHOOL TYPE (PRIVATE)
	SCH.MISS		20	SCHOOL TYPE (MISSING)

Table B.32

Estimated Effects for Science Trend Conditioning Variables
1981-82: Age 17

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	0.247207	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.441003	2 SEX (FEMALE)
3	ETHNIC2	-1.038798	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.650045	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.384856	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.359896	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.210354	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	0.024158	8 REGION (SOUTHEAST)
9	REGION3	0.062773	9 REGION (CENTRAL)
10	REGION4	0.015087	10 REGION (WEST)
11	PARED2	0.138555	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.429813	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.617670	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	-0.190094	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.624983	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.098699	16 MODAL GRADE (GREATER THAN MODAL GRADE)
	HOMEITM3		17 ARTICLES IN HOME (YES TO 3)
	HOMEITM4		18 ARTICLES IN HOME (YES TO 4)
17	SCH.PRIV	-0.009154	19 SCHOOL TYPE (PRIVATE)
	SCH.MISS		20 SCHOOL TYPE (MISSING)

Table B.33

Estimated Effects for Science Trend Conditioning Variables
1986: Age 9, Bridge A

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-0.379284	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.161779	2 SEX (FEMALE)
3	ETHNIC2	-0.669729	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.489115	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.102341	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.703567	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.464462	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.115330	8 REGION (SOUTHEAST)
9	REGION3	-0.041812	9 REGION (CENTRAL)
10	REGION4	-0.090698	10 REGION (WEST)
11	PARED2	0.169671	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.429293	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.385039	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.122934	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.629587	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.403331	16 MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.258453	17 ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.349804	18 ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	-0.023166	19 SCHOOL TYPE (PRIVATE)

Table B.34

Estimated Effects for Science Trend Conditioning Variables
1986: Age 9, Bridge B

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-0.769386	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.038277	2 SEX (FEMALE)
3	ETHNIC2	-0.739842	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.586415	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.103627	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.891562	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.548884	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.129702	8 REGION (SOUTHEAST)
9	REGION3	0.011742	9 REGION (CENTRAL)
10	REGION4	-0.119800	10 REGION (WEST)
11	PARED2	-0.004067	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.271551	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.218143	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.045211	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.871979	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.411836	16 MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.219618	17 ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.336150	18 ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	-0.074180	19 SCHOOL TYPE (PRIVATE)

Table B.35

Estimated Effects for Science Trend Conditioning Variables
1986: Age 13, Bridge A

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-0.693683	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.219859	2 SEX (FEMALE)
3	ETHNIC2	-0.691137	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.492987	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.099713	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.414012	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.246599	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.033529	8 REGION (SOUTHEAST)
9	REGION3	-0.023863	9 REGION (CENTRAL)
10	REGION4	-0.078740	10 REGION (WEST)
11	PARED2	0.138635	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.329713	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.428845	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.054985	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.458554	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.267685	16 MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.201938	17 ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.340467	18 ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	0.010178	19 SCHOOL TYPE (PRIVATE)
	SCH.MISS		20 SCHOOL TYPE (MISSING)

Table B.36

Estimated Effects for Science Trend Conditioning Variables
1986: Age 13, Bridge B

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-0.915927	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.198725	2 SEX (FEMALE)
3	ETHNIC2	-0.639180	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.289440	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	-0.147956	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.363875	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.321760	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.176897	8 REGION (SOUTHEAST)
9	REGION3	-0.010910	9 REGION (CENTRAL)
10	REGION4	-0.224578	10 REGION (WEST)
11	PARED2	0.101594	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.414792	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.444902	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	0.128516	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.672904	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.136297	16 MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.227592	17 ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.398187	18 ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	0.188192	19 SCHOOL TYPE (PRIVATE)
	SCH.MISS		20 SCHOOL TYPE (MISSING)

Table B.37

Estimated Effects for Science Trend Conditioning Variables
1986: Age 17

	VARIABLE LABEL	ESTIMATED EFFECT	DESCRIPTION
1	OVERALL	-0.317737	1 OVERALL CONSTANT '1' FOR EVERYONE
2	GENDER2	-0.307810	2 SEX (FEMALE)
3	ETHNIC2	-0.624208	3 OBSERVED ETHNICITY (BLACK)
4	ETHNIC3	-0.361968	4 OBSERVED ETHNICITY (HISPANIC)
5	ETHNIC4	0.018743	5 OBSERVED ETHNICITY (ASIAN AMERICAN)
6	STOC2	0.434584	6 SIZE AND TYPE OF COMMUNITY (HIGH METRO)
7	STOC3	0.443949	7 SIZE AND TYPE OF COMMUNITY (NOT HIGH OR LOW)
8	REGION2	-0.089567	8 REGION (SOUTHEAST)
9	REGION3	0.017682	9 REGION (CENTRAL)
10	REGION4	-0.165501	10 REGION (WEST)
11	PARED2	0.214393	11 PARENTS EDUCATION (HIGH SCHOOL GRAD)
12	PARED3	0.516285	12 PARENTS EDUCATION (POST HIGH SCHOOL)
13	PARED4	0.609179	13 PARENTS EDUCATION (COLLEGE GRAD)
14	PARED_	-0.330536	14 PARENTS EDUCATION (MISSING, I DON'T KNOW)
15	< MODALG	-0.468667	15 MODAL GRADE (LESS THAN MODAL GRADE)
16	> MODALG	0.160284	16 MODAL GRADE (GREATER THAN MODAL GRADE)
17	HOMEITM3	0.219045	17 ARTICLES IN HOME (YES TO 3)
18	HOMEITM4	0.405511	18 ARTICLES IN HOME (YES TO 4)
19	SCH.PRIV	0.301300	19 SCHOOL TYPE (PRIVATE)
	SCH.MISS	.	20 SCHOOL TYPE (MISSING)

APPENDIX C

WARM Variables Tables

Appendix C

WARM VARIABLES TABLES

Bruce Kaplan

Educational Testing Service

Appendix C contains 12 tables showing the relationship between NAEP items and WARM scores for reading (Tables C.1 through C.4), mathematics (Tables C.5 through C.8), and science (Tables C.9 through C.12). Certain of these WARM scores were used in the subject area reports. Other WARM variables were excluded from the reports because of their minimal relationships with the proficiency values.

The first three tables for each learning area (one table for each grade/age) contain the items used to construct each WARM score. Each WARM variable and short description is followed by a list of the NAEP items used in its construction. Each NAEP item is shown with its corresponding short description, the block in which it appears, and its location within the block.

The WARM variable names (for example, RW1Ax) are created from:

- the initial letter of the learning area (R for reading, M for mathematics, or S for science);
- the WARM variable identifier (W);
- the cohort number (1 for grade 3/age 9, 2 for grade 7/age 13, or 3 for grade 11/age 17);
- the WARM score identifier (A, B, C, D, E, F, G, or H); and
- the plausible value identifier (x), representing plausible values 1 though 5.

The remaining tables show how NAEP item responses were rescored to calculate WARM scores for reading (Table C.4), mathematics (Table C.8), and science (Table C.12). All items used to construct WARM scores for a given learning area are listed in NAEP ID order. If an item was used to construct a particular WARM score for one or more cohorts, the appropriate WARM score identifier (A through H) appears in the appropriate COHORT column(s) (1, 2, or 3). Each item in a learning area was used to construct only one WARM score for a given cohort.

The right side of Tables C.4, C.8, and C.12 shows how each NAEP item was rescored to calculate the WARM score. The column headings indicate the original item responses (1 through 8, and MISSING). Listed below these headings are the values to which the responses were recoded.

For example, in Table C.4, reading item S003301 was used to calculate reading WARM score C for cohort 2 (grade 7/age 13) and cohort 3 (grade 11/age 17). Original item responses 1, 2, and 3 were respectively recoded as 1, 3, and 5.

Table C.1

Reading WARM Variables

Grade 3/Age 9

		BLOCK	ITEM
	RW1Ax - Study habits		
S004701	HOW OFTEN DOES TEACHER LIST OF QUESTS AS YOU READ	R2	4
S004703	HOW OFTEN DOES TEACHER TELL HOW TO READ FASTER	R2	6
S005102	HOW OFTEN WHEN STUDY FOR TEST: TAKE NOTES ON READ	R1	2
S005103	HOW OFTEN WHEN STUDY FOR TEST: MAKE OUTLINES	R1	3
	RW1Bx - Reading habits		
S003502	HOW OFTEN DO YOU TELL A FRIEND ABOUT A GOOD BOOK	R3	3
S003504	HOW OFTEN DO YOU SPEND YOUR OWN MONEY ON BOOKS	R3	5
S003505	HOW OFTEN DO YOU READ BOOK BASED ON MOVIE YOU SAW	R3	6
S003506	HOW OFTEN DO YOU READ BOOKS BY AN AUTHOR YOU LIKE	R3	7
S007201	HOW OFTEN YOU TALK AT HOME ABOUT SOMETHING READ	R4	1
S007202	HOW OFTEN YOU TALK W/FRIEND ABOUT SOMETHING READ	R4	2
S007302	HOW OFTEN DO YOU READ PART OF NEWSPAPER	R5	2
S007303	HOW OFTEN DO YOU READ PART OF MAGAZINE	R5	3
S007305	HOW OFTEN DO YOU READ BIOGRAPHY	R5	5
	RW1Cx - Instruction		
S004601	WITH NEW READING HOW OFTEN TEACHER POINT HARD WORD	R2	1
S004602	WITH NEW READING HOW OFTEN TEACHER PREVIEW READING	R2	2
S004603	WITH NEW READING HOW OFTEN TEACHER READ PART ALOUD	R2	3
S004702	HOW OFTEN DOES TEACHER TELL HOW TO FIND MAIN IDEA	R2	5
S005101	HOW OFTEN WHEN STUDY FOR TEST: READ OVER MATERIAL	R1	1
S005104	HOW OFTEN WHEN STUDY FOR TEST: QUES IN TEXTBOOK	R1	4
S005203	HOW OFTEN DO YOU WORK IN A WORKBOOK	R1	9
	RW1Dx - Individual reading		
S003501	HOW OFTEN DO YOU READ FOR FUN ON YOUR OWN TIME	R3	2
S005202	HOW OFTEN DO YOU READ ON YOUR OWN IN SCHOOL	R1	8
S007301	HOW OFTEN DO YOU READ PART OF NOVEL OR STORY	R5	1
	RW1Ex - Reading aloud		
S004401	HOW OFTEN DOES SOMEONE READ ALOUD TO YOU	R1	10
S004402	HOW OFTEN DO YOU READ ALOUD TO SOMEONE	R1	11
S005201	HOW OFTEN DO YOU READ ALOUD IN SCHOOL	R1	7

Table C.2

Reading WARM Variables

Grade 7/Age 13

		BLOCK	ITEM
	RW2Ax - Study habits		
S005102	HOW OFTEN WHEN STUDY FOR TEST: TAKE NOTES ON READ	R1	2
S005103	HOW OFTEN WHEN STUDY FOR TEST: MAKE OUTLINES	R1	3
S005104	HOW OFTEN WHEN STUDY FOR TEST: QUES IN TEXTBOOK	R1	4
S005105	HOW OFTEN WHEN STUDY FOR TEST: ANSWER OWN QUESTNS	R1	5
S005106	HOW OFTEN WHEN STUDY FOR TEST: QUESTION OTHERS	R1	6
S005301	HOW OFTEN GO TO LIBRARY TO READ ON OWN	R1	10
S005302	HOW OFTEN GO TO LIBRARY TO LOOK UP FACT FOR SCHOOL	R1	11
S005303	HOW OFTEN GO TO LIBRARY TO FIND BOOKS FOR HOBBIES	R1	12
S005304	HOW OFTEN GO TO LIBRARY FOR QUIET PLACE TO READ	R1	13
	RW2Bx - Reading habits		
S004601	WITH NEW READING HOW OFTEN TEACHER POINT HARD WORD	R2	1
S004602	WITH NEW READING HOW OFTEN TEACHER PREVIEW READING	R2	2
S004603	WITH NEW READING HOW OFTEN TEACHER READ PART ALOUD	R2	3
S004701	HOW OFTEN DOES TEACHER LIST OF QUESTS AS YOU READ	R2/R4	4/1
S004702	HOW OFTEN DOES TEACHER TELL HOW TO FIND MAIN IDEA	R2/R4	5/2
S004703	HOW OFTEN DOES TEACHER TELL HOW TO READ FASTER	R2	6
	RW2Cx - Instruction		
S003301	WHAT KIND OF READER ARE YOU	R1	19
S004301	HOW OFTEN DO YOU READ A STORY OR NOVEL	R3	1
S004302	HOW OFTEN DO YOU READ A POEM	R3	2
S004303	HOW OFTEN DO YOU READ A PLAY	R3	3
S004307	HOW OFTEN DO YOU READ A BIOGRAPHY	R3	7
S004309	HOW OFTEN DO YOU READ A BOOK ABOUT OTHER TIMES	R3	9
S004311	HOW OFTEN DO YOU READ WORDS OF A SONG	R3	11
S004503	HOW OFTEN DOES FAMILY READ BOOKS	R3	14
S005201	HOW OFTEN DO YOU READ ALOUD IN SCHOOL	R1	7
S005202	HOW OFTEN DO YOU READ ON YOUR OWN IN SCHOOL	R1	8
S005305	HOW OFTEN GO TO LIBRARY TO TAKE OUT BOOKS	R1	14
S007201	HOW OFTEN YOU TALK AT HOME ABOUT SOMETHING READ	R6	1
S007202	HOW OFTEN YOU TALK W/FRIEND ABOUT SOMETHING READ	R6	2

Table C.2
(continued)

		BLOCK	ITEM
	RW2Dx - Individual reading		
S004304	HOW OFTEN DO YOU READ A NEWSPAPER	R3	4
S004305	HOW OFTEN DO YOU READ A MAGAZINE	R3	5
S004310	HOW OFTEN DO YOU READ A SPORTS BOOK	R3	10
S004501	HOW OFTEN DOES FAMILY READ NEWSPAPERS	R3	12
S004502	HOW OFTEN DOES FAMILY READ MAGAZINES	R3	13
S004504	HOW OFTEN DOES FAMILY READ RECIPES	R3	15
S005402	HOW OFTEN DO YOU READ A NEWS MAGAZINE	R1	16
S005403	HOW OFTEN DO YOU READ NEWSPAPER NOT COMICS OR SPRT	R1	17

Table C.3

Reading WARM Variables

Grade 11/Age 17

		BLOCK	ITEM
	RW3Ax - Study habits		
S005102	HOW OFTEN WHEN STUDY FOR TEST: TAKE NOTES ON READ	R1	2
S005103	HOW OFTEN WHEN STUDY FOR TEST: MAKE OUTLINES	R1	3
S005104	HOW OFTEN WHEN STUDY FOR TEST: QUES IN TEXTBOOK	R1	4
S005105	HOW OFTEN WHEN STUDY FOR TEST: ANSWER OWN QUESTNS	R1	5
S005106	HOW OFTEN WHEN STUDY FOR TEST: QUESTION OTHERS	R1	6
S005301	HOW OFTEN GO TO LIBRARY TO READ ON OWN	R1	10
S005302	HOW OFTEN GO TO LIBRARY TO LOOK UP FACT FOR SCHOOL	R1	11
S005303	HOW OFTEN GO TO LIBRARY TO FIND BOOKS FOR HOBBIES	R1	12
S005304	HOW OFTEN GO TO LIBRARY FOR QUIET PLACE TO READ	R1	13
	RW3Bx - Reading habits		
S004601	WITH NEW READING HOW OFTEN TEACHER POINT HARD WORD	R2	1
S004602	WITH NEW READING HOW OFTEN TEACHER PREVIEW READING	R2	2
S004603	WITH NEW READING HOW OFTEN TEACHER READ PART ALOUD	R2	3
S004701	HOW OFTEN DOES TEACHER LIST OF QUESTS AS YOU READ	R2	4
S004701	HOW OFTEN DOES TEACHER LIST OF QUESTS AS YOU READ	R4	1
S004702	HOW OFTEN DOES TEACHER TELL HOW TO FIND MAIN IDEA	R2	5
S004702	HOW OFTEN DOES TEACHER TELL HOW TO FIND MAIN IDEA	R4	2
S004703	HOW OFTEN DOES TEACHER TELL HOW TO READ FASTER	R2	6
	RW3Cx - Instruction		
S003301	WHAT KIND OF READER ARE YOU	R1	19
S004301	HOW OFTEN DO YOU READ A STORY OR NOVEL	R3	1
S004302	HOW OFTEN DO YOU READ A POEM	R3	2
S004303	HOW OFTEN DO YOU READ A PLAY	R3	3
S004307	HOW OFTEN DO YOU READ A BIOGRAPHY	R3	7
S004309	HOW OFTEN DO YOU READ A BOOK ABOUT OTHER TIMES	R3	9
S004311	HOW OFTEN DO YOU READ WORDS OF A SONG	R3	11
S004503	HOW OFTEN DOES FAMILY READ BOOKS	R3	14
S005201	HOW OFTEN DO YOU READ ALOUD IN SCHOOL	R1	7
S005202	HOW OFTEN DO YOU READ ON YOUR OWN IN SCHOOL	R1	8
S005305	HOW OFTEN GO TO LIBRARY TO TAKE OUT BOOKS	R1	14
S007201	HOW OFTEN YOU TALK AT HOME ABOUT SOMETHING READ	R6	1
S007202	HOW OFTEN YOU TALK W/FRIEND ABOUT SOMETHING READ	R6	2

Table C.3
(continued)

		BLOCK	ITEM
	RW3Dx - Individual reading		
S004304	HOW OFTEN DO YOU READ A NEWSPAPER	R3	4
S004305	HOW OFTEN DO YOU READ A MAGAZINE	R3	5
S004310	HOW OFTEN DO YOU READ A SPORTS BOOK	R3	10
S004501	HOW OFTEN DOES FAMILY READ NEWSPAPERS	R3	12
S004502	HOW OFTEN DOES FAMILY READ MAGAZINES	R3	13
S004504	HOW OFTEN DOES FAMILY READ RECIPES	R3	15
S005402	HOW OFTEN DO YOU READ A NEWS MAGAZINE	R1	16
S005403	HOW OFTEN DO YOU READ NEWSPAPER NOT COMICS OR SPRT	R1	17

Table C.4

Derivation of Reading WARM Scores

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
1	S003301		C	C	1	3	5						M
2	S003501	D			5	4	3	2	1				M
3	S003502	B			5	4	3	2	1				M
4	S003504	B			5	4	3	2	1				M
5	S003505	B			5	4	3	2	1				M
6	S003506	B			5	4	3	2	1				M
7	S004301		C	C	5	4	3	2	1				M
8	S004302		C	C	5	4	3	2	1				M
9	S004303		C	C	5	4	3	2	1				M
10	S004304		D	D	5	4	3	2	1				M
11	S004305		D	D	5	4	3	2	1				M
12	S004307		C	C	5	4	3	2	1				M
13	S004309		C	C	5	4	3	2	1				M
14	S004310		D	D	5	4	3	2	1				M
15	S004311		C	C	5	4	3	2	1				M
16	S004401	E			5	4	3	2	1				M
17	S004402	E			5	4	3	2	1				M
18	S004501		D	D	5	4	3	2	1				M
19	S004502		D	D	5	4	3	2	1				M
20	S004503		C	C	5	4	3	2	1				M
21	S004504		D	D	5	4	3	2	1				M
22	S004601	C	B	B	5	4	3	2	1				M
23	S004602	C	B	B	5	4	3	2	1				M
24	S004603	C	B	B	5	4	3	2	1				M
25	S004701	A	B	B	5	4	3	2	1				M
26	S004702	C	B	B	5	4	3	2	1				M
27	S004703	A	B	B	5	4	3	2	1				M
28	S005101	C			5	4	3	2	1				M
29	S005102	A	A	A	5	4	3	2	1				M
30	S005103	A	A	A	5	4	3	2	1				M
31	S005104	C	A	A	5	4	3	2	1				M
32	S005105		A	A	5	4	3	2	1				M
33	S005106		A	A	5	4	3	2	1				M
34	S005201	E	C	C	5	4	3	2	1				M
35	S005202	D	C	C	5	4	3	2	1				M
36	S005203	C			5	4	3	2	1				M
37	S005301		A	A	5	4	3	2	1				M
38	S005302		A	A	5	4	3	2	1				M
39	S005303		A	A	5	4	3	2	1				M
40	S005304		A	A	5	4	3	2	1				M

Table C.4
(continued)

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
41	S005305		C	C	5	4	3	2	1				M
42	S005402		D	D	5	4	3	2	1				M
43	S005403		D	D	5	4	3	2	1				M
44	S007201	B	C	C	5	4	3	2	1				M
45	S007202	B	C	C	5	4	3	2	1				M
46	S007301	D			5	4	3	2	1				M
47	S007302	B			5	4	3	2	1				M
48	S007303	B			5	4	3	2	1				M
49	S007305	B			5	4	3	2	1				M

Table C.5

Mathematics WARM Variables

Grade 3/Age 9

		BLOCK	ITEM
	MW1Ax - Enjoyment of math		
S205701	ARE YOU AS GOOD IN MATH AS OTHERS YOUR AGE	M4	6
S205901	TRUE I USUALLY UNDERSTAND CURRENT MATH LESSON	M5	1
S205902	TRUE I AM GOOD WITH NUMBERS	M5	2
S205903	TRUE DOING MATH MAKES ME NERVOUS	M5	3
S205904	TRUE MATH IS BORING	M5	4
S205905	TRUE I AM WILLING TO WORK HARD TO DO WELL IN MATH	M5	5
S205906	TRUE I LIKE MATHEMATICS	M5	6
S206701	FEEL:LIKE TO PLAY MATHEMATICS GAMES	M7	1
S206702	FEEL:HELPS ME TO PLAY MATHEMATICS GAMES	M7	2
S207101	FEEL:WOULD LIKE TO WORK AT JOB USING MATH	M7	7
	MW1Bx - Calculator usage		
S206101	HOW OFTEN USE A CALCULATOR IN MATH CLASS	M5	7
S206102	HOW OFTEN USE A CALCULATOR IN SCIENCE CLASS	M5	8
S206103	HOW OFTEN USE A CALCULATOR IN OTHER CLASSES	M5	9
S206104	HOW OFTEN USE A CALCULATOR OUTSIDE OF SCHOOL	M5	10
	MW1Cx - Participation in math		
S207601	HOW OFTEN DO YOU LISTEN TO MATH LESSON EXPLAINED	M6	1
S207602	HOW OFTEN DO YOU WATCH MATH TEACHER WORK PROBLEMS	M6	2
S207603	HOW OFTEN DO YOU USE MATH WORKBOOK OR DITTO SHEETS	M6	3
S207604	HOW OFTEN DO YOU WORK MATH PROBLEMS AT BOARD	M6	4
S207606	HOW OFTEN DO YOU WORK MATH PROBLEMS ALONE	M6	6
	MW1Dx - Gets help in math		
S205502	DO SIBLINGS REGULARLY HELP WITH MATH HOMEWORK	M4	2
S205503	DO FRIENDS REGULARLY HELP WITH MATH HOMEWORK	M4	3
S206703	FEEL:LIKE GETTING HELP FROM TEACHER ON MATH	M7	3
S206704	FEEL:HELPS TO GET HELP FROM TEACHER ON MATH	M7	4
S206705	FEEL:LIKE GETTING HELP FROM FRIEND ON MATH	M7	5
S206706	FEEL:HELPS TO GET HELP FROM FRIEND ON MATH	M7	6

Table C.5
(continued)

		BLOCK	ITEM
	MW1Ex - Computer usage		
B003801	HOW MANY HOURS DO YOU SPEND ON HOMEWORK	B1	14
S205601	HOW MUCH TIME SPENT/WK ON MATH HOMEWORK	M4	5
S207608	HOW OFTEN DO YOU DO MATH HOMEWORK	M6	8
B004301	HAVE YOU USED COMPUTER W/KEYBOARD AND SCREEN	B1	19
B004401	DOES FAMILY OWN COMPUTER W/KEYBOARD AND SCREEN	B1	20
B004501	ARE YOU STUDYING COMPUTERS	B1	21
B004601	DO YOU USE COMPUTERS FOR MATH, READING, ETC	B1	22

Table C.6

Mathematics WARM Variables

Grade 7/Age 13

MW2Ax - Positive attitude

		BLOCK	ITEM
S202201	FEEL:WILLING TO WORK HARD TO DO WELL IN MATH	M2	1
S202204	FEEL:MATH USEFUL IN SOLVING EVERY DAY PROBLEMS	M2	4
S202206	FEEL:ENJOY MATHEMATICS	M2	6
S202901	FEEL:I AM GOOD AT MATHEMATICS	M3	1
S202902	FEEL:MATH HELPS A PERSON THINK LOGICALLY	M3	2
S202905	FEEL:I AM TAKING MATH ONLY BECAUSE I HAVE TO	M3	5
S202908	FEEL:I WOULD LIKE TO TAKE MORE MATHEMATICS	M3	8
S206001	DO YOU FEEL AS GOOD IN MATH AS OTHERS IN CLASS	M5	16
S209001	WILL YOUR CAREER REQUIRE USE OF MATH SKILLS	M5	17
S209501	FEEL MOST OF MATH HAS PRACTICAL USE	M7	1
S209509	AGREE WANT PERSONAL SUCCESS IN MATH	M7	9
S209510	FEEL PARENTS WANT ME TO DO WELL IN MATH	M7	10
S209511	FEEL GOOD WHEN SOLVE A MATH PROBLEM ALONE	M7	11
S209515	AGREE LIKES TO BE CHALLENGED W/DIFFICULT PROBLEM	M7	15
S211003	DO YOU LIKE OR DISLIKE MATHEMATICS	M8	3
S211008	HOW EASY OR HARD IS MATHEMATICS	M8	8
S211013	HOW IMPORTANT OR NOT IS MATHEMATICS	M8	13
S211305	DO YOU AGREE A GOOD GRADE IN MATH IS IMPORTANT	M9	5

MW2Bx - Seeks assistance

		BLOCK	ITEM
S207501	HOW OFTEN DO YOU LISTEN TO MATH LESSON EXPLAINED	M6	1
S207502	HOW OFTEN WATCH TEACHER WORK PROBLEM ON BOARD	M6	2
S207503	HOW OFTEN USE A MATH TEXTBOOK	M6	3
S207507	HOW OFTEN WORKS MATH PROBLEMS ALONE	M6	7
S207510	HOW OFTEN DO YOU TALK ABOUT MATH IN CLASS	M6	10
S207512	HOW OFTEN DO YOU DO MATH HOMEWORK	M6	12
S211401	HOW OFTEN GETS INDIVIDUAL HELP FROM MA TEACHER	M9	9
S211402	HOW OFTEN GETS HELP FROM CLASSMATE W/MATH	M9	10
S211403	HOW OFTEN HELPS CLASSMATE WITH MATH	M9	11

MW2Cx - Does math on own

		BLOCK	ITEM
S207508	HOW OFTEN DO YOU DO MATH LABORATORY ACTIVITIES	M6	8
S207509	HOW OFTEN DO YOU DO MATH REPORTS AND PROJECTS	M6	9
S211404	HOW OFTEN CHOOSE MATH TOPICS YOU WANT TO STUDY	M9	12
S211405	HOW OFTEN PLAYS MATH GAMES	M9	13
S211406	HOW OFTEN WORKS AHEAD IN MATH BOOK	M9	14
S211407	HOW OFTEN DOES MATH PROBLEMS NOT ASSIGNED	M9	15
S211408	HOW OFTEN STUDY MATH TOPICS NOT IN TEXTBOOK	M9	16

Table C.6
(continued)

		BLOCK	ITEM
	MW2Dx - Computer usage		
B004301	HAVE YOU USED COMPUTER W/KEYBOARD AND SCREEN	B1	18
B004401	DOES FAMILY OWN COMPUTER W/KEYBOARD AND SCREEN	B1	19
B004501	ARE YOU STUDYING COMPUTERS	B1	20
B004601	DO YOU USE COMPUTERS FOR MATH, READING, ETC	B1	21
S201601	EVER STUDY MATH THROUGH COMPUTER INSTRUCTION	M1	1
S201605	EVER USE COMPUTER TO SOLVE LINEAR PROGRAM PROBLEM	M1	5
S201606	EVER USE COMPUTER TO SOLVE A MATH PROBLEM	M1	6
S201608	EVER USE COMPUTER TO PROCESS BUSINESS,SCI,SOC INFO	M1	8
S201609	EVER USE COMPUTER TO PERFORM STAT ANALYSIS	M1	9
S201610	EVER WRITE PROGRAM TO SOLVE LINEAR PROGRAM PROBLEM	M1	10
S201611	EVER WRITE PROGRAM TO SOLVE A MATH PROBLEM	M1	11
S201612	EVER WRITE PROGRAM TO PLAY A GAME	M1	12
S201613	EVER WRITE PROGRAM TO PROCESS BUSINESS,SCI,SOC,INF	M1	13
S201614	EVER WRITE PROGRAM TO PERFORM STAT ANALYSIS	M1	14
	MW2Ex - Calculator usage		
S206101	HOW OFTEN USE A CALCULATOR IN MATH CLASS	M5	1
S206102	HOW OFTEN USE A CALCULATOR IN SCIENCE CLASS	M5	2
S206103	HOW OFTEN USE A CALCULATOR IN OTHER CLASSES	M5	3
S206104	HOW OFTEN USE A CALCULATOR OUTSIDE OF SCHOOL	M5	4
S208701	HOW OFTEN DO YOU USE A CALCULATOR	M4	14
S208801	USE A CALCULATOR IN MATH FOR HOMEWORK	M5	5
S208802	USE A CALCULATOR IN MATH FOR CHECKING ANSWERS	M5	6
S208803	USE A CALCULATOR IN MATH FOR ROUTINE COMPUTATIONS	M5	7
S208804	USE A CALCULATOR IN MATH FOR SOLVING PROBLEMS	M5	8
S208805	USE A CALCULATOR IN MATH FOR TAKING TESTS	M5	9
S208806	USE A CALCULATOR IN MATH FOR SOMETHING ELSE	M5	10
	MW2Fx - Encouragement received		
S205401	WHAT EXTENT HAVE PARENTS ENCOURAGED MA COURSES	M4	1
S205402	WHAT EXTENT HAVE SIBLINGS ENCOURAGED MA COURSES	M4	2
S205403	WHAT EXTENT HAVE RELATIVE ENCOURAGED MA COURSES	M4	3
S205404	WHAT EXTENT HAVE TEACHERS ENCOURAGED MA COURSES	M4	4
S205405	WHAT EXTENT HAVE COUNSELOR ENCOURAGED MA COURSES	M4	5
S205406	WHAT EXTENT HAVE PEERS ENCOURAGED MA COURSES	M4	6

Table C.7

Mathematics WARM Variables

Grade 11/Age 17

		BLOCK	ITEM
	MW3Ax - Positive attitude		
S202901	FEEL:I AM GOOD AT MATHEMATICS	M3	1
S202902	FEEL:MATH HELPS A PERSON THINK LOGICALLY	M3	2
S202905	FEEL:I AM TAKING MATH ONLY BECAUSE I HAVE TO	M3	5
S202908	FEEL:I WOULD LIKE TO TAKE MORE MATHEMATICS	M3	8
S202911	FEEL:I UNDERSTAND WHAT WE TALK ABOUT IN MATH	M3	11
S206001	DO YOU FEEL AS GOOD IN MATH AS OTHERS IN CLASS	M5	16
S209001	WILL YOUR CAREER REQUIRE USE OF MATH SKILLS	M5	17
S209501	FEEL MOST OF MATH HAS PRACTICAL USE	M7	1
S209509	AGREE WANT PERSONAL SUCCESS IN MATH	M7	9
S209510	FEEL PARENTS WANT ME TO DO WELL IN MATH	M7	10
S209511	FEEL GOOD WHEN SOLVE A MATH PROBLEM ALONE	M7	11
S209515	AGREE LIKES TO BE CHALLENGED W/DIFFICULT PROBLEM	M7	15
S211003	DO YOU LIKE OR DISLIKE MATHEMATICS	M8	3
S211008	HOW EASY OR HARD IS MATHEMATICS	M8	8
S211013	HOW IMPORTANT OR NOT IS MATHEMATICS	M8	13
S212001	FEEL:WILLING TO WORK HARD TO DO WELL IN MATH	M9	1
S212004	FEEL:MATH USEFUL IN SOLVING EVERYDAY PROBLEMS	M9	4
S212006	FEEL:ENJOY MATHEMATICS	M9	6
S212008	FEEL:A GOOD GRADE IN MATH IS IMPORTANT TO ME	M9	8
S212101	FEEL:I UNDERSTAND WHAT WE TALK ABOUT IN MATH	M9	12
S212102	FEEL:GOOD AT WORKING WITH NUMBERS	M9	13
S212103	FEEL:DOING MATHEMATICS MAKES ME NERVOUS	M9	14
S212104	FEEL:MATHEMATICS IS BORING FOR ME	M9	15
S212105	FEEL:WILLING TO WORK HARD TO DO WELL IN MATH	M9	16
	MW3Bx - Seeks assistance		
S203701	HOW OFTEN DID YOU TAKE MATH TESTS	M2	1
S203702	HOW OFTEN DID YOU DO MATH HOMEWORK	M2	2
S203703	HOW OFTEN DID YOU HELP A CLASSMATE DO MATH	M2	3
S203705	HOW OFTEN DID YOU LISTEN TO LESSON EXPLANATION	M2	5
S203706	HOW OFTEN DID YOU SEE TEACHER DO MATH ON BOARD	M2	6
S203707	HOW OFTEN DID YOU GET TEACHER'S HELP WITH MATH	M2	7
S203711	HOW OFTEN DID YOU GET FRIEND'S HELP WITH MATH	M2	11
S203713	HOW OFTEN DID YOU DISCUSS MATHEMATICS IN CLASS	M2	13
S203714	HOW OFTEN DID YOU WORK MATH PROBLEMS AT BOARD	M2	14
S206601	HOW MUCH TIME SPENT/WK ON MATH HOMEWORK	M4	11
S207501	HOW OFTEN DO YOU LISTEN TO MATH LESSON EXPLAINED	M6	1
S207502	HOW OFTEN WATCH TEACHER WORK PROBLEM ON BOARD	M6	2
S207503	HOW OFTEN USE A MATH TEXTBOOK	M6	3
S207507	HOW OFTEN WORKS MATH PROBLEMS ALONE	M6	7

Table C.7
(continued)

		BLOCK	ITEM
(continued) MW3Bx - Seeks assistance			
S207510	HOW OFTEN DO YOU TALK ABOUT MATH IN CLASS	M6	10
S211401	HOW OFTEN GETS INDIVIDUAL HELP FROM MA TEACHER	M10	3
S211402	HOW OFTEN GETS HELP FROM CLASSMATE W/MATH	M10	4
S211403	HOW OFTEN HELPS CLASSMATE WITH MATH	M10	5
S211410	HOW OFTEN DO YOU DO MATH HOMEWORK	M10	2
	MW3Cx - Does math on own		
S203704	HOW OFTEN DID YOU PLAY MATHEMATICS GAMES	M2	4
S203708	HOW OFTEN DID YOU MAKE REPORTS/PROJECTS IN MATH	M2	8
S203709	HOW OFTEN DID YOU WORK AHEAD IN YOUR MATH BOOK	M2	9
S203710	HOW OFTEN DID YOU DO MATH PROBLEMS NOT ASSIGNED	M2	10
S203712	HOW OFTEN DID YOU STUDY TOPIC NOT IN TEXTBOOK	M2	12
S207508	HOW OFTEN DO YOU DO MATH LABORATORY ACTIVITIES	M6	8
S207509	HOW OFTEN DO YOU DO MATH REPORTS AND PROJECTS	M6	9
S211404	HOW OFTEN CHOOSE MATH TOPICS YOU WANT TO STUDY	M10	6
S211405	HOW OFTEN PLAYS MATH GAMES	M10	7
S211406	HOW OFTEN WORKS AHEAD IN MATH BOOK	M10	8
S211407	HOW OFTEN DOES MATH PROBLEMS NOT ASSIGNED	M10	9
S211408	HOW OFTEN STUDY MATH TOPICS NOT IN TEXTBOOK	M10	10
	MW3Dx - Computer usage		
B004301	HAVE YOU USED COMPUTER W/KEYBOARD AND SCREEN	B1	18
B004401	DOES FAMILY OWN COMPUTER W/KEYBOARD AND SCREEN	B1	19
S201601	EVER STUDY MATH THROUGH COMPUTER INSTRUCTION	M1	1
S201605	EVER USE COMPUTER TO SOLVE LINEAR PROGRAM PROBLEM	M1	5
S201606	EVER USE COMPUTER TO SOLVE A MATH PROBLEM	M1	6
S201608	EVER USE COMPUTER TO PROCESS BUSINESS,SCI,SOC INFO	M1	8
S201612	EVER WRITE PROGRAM TO PLAY A GAME	M1	12
S201613	EVER WRITE PROGRAM TO PROCESS BUSINESS,SCI,SOC,INF	M1	13
S201614	EVER WRITE PROGRAM TO PERFORM STAT ANALYSIS	M1	14

Table C.7
(continued)

		BLOCK	ITEM
	MW3Ex - Calculator usage		
S206101	HOW OFTEN USE A CALCULATOR IN MATH CLASS	M5	1
S206102	HOW OFTEN USE A CALCULATOR IN SCIENCE CLASS	M5	2
S206103	HOW OFTEN USE A CALCULATOR IN OTHER CLASSES	M5	3
S206104	HOW OFTEN USE A CALCULATOR OUTSIDE OF SCHOOL	M5	4
S208701	HOW OFTEN DO YOU USE A CALCULATOR	M4	14
S208801	USE A CALCULATOR IN MATH FOR HOMEWORK	M5	5
S208802	USE A CALCULATOR IN MATH FOR CHECKING ANSWERS	M5	6
S208803	USE A CALCULATOR IN MATH FOR ROUTINE COMPUTATIONS	M5	7
S208804	USE A CALCULATOR IN MATH FOR SOLVING PROBLEMS	M5	8
S208805	USE A CALCULATOR IN MATH FOR TAKING TESTS	M5	9
S208806	USE A CALCULATOR IN MATH FOR SOMETHING ELSE	M5	10
	MW3Fx - Encouragement received		
S205401	WHAT EXTENT HAVE PARENTS ENCOURAGED MA COURSES	M4	1
S205402	WHAT EXTENT HAVE SIBLINGS ENCOURAGED MA COURSES	M4	2
S205403	WHAT EXTENT HAVE RELATIVE ENCOURAGED MA COURSES	M4	3
S205404	WHAT EXTENT HAVE TEACHERS ENCOURAGED MA COURSES	M4	4
S205405	WHAT EXTENT HAVE COUNSELOR ENCOURAGED MA COURSES	M4	5
S205406	WHAT EXTENT HAVE PEERS ENCOURAGED MA COURSES	M4	6

Table C.8

Derivation of Mathematics WARM Scores

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
1	B003801	E			1	2	3	4	5				M
2	B004301	F	D	D	5	1							M
3	B004401	F	D	D	5	1							M
4	B004501	F	D		5	1							M
5	B004601	F	D		5	1							M
6	B005312			D	5	1							M
7	B005313			D	5	1							M
8	S201601		D	D	5	1	1						1
9	S201605		D	D	5	1	1						1
10	S201606		D	D	5	1	1						1
11	S201608		D	D	5	1	1						1
12	S201609		D	D	5	1	1						1
13	S201610		D	D	5	1	1						1
14	S201611		D	D	5	1	1						1
15	S201612		D	D	5	1	1						1
16	S201613		D	D	5	1	1						1
17	S201614		D	D	5	1	1						1
18	S202201		A		1	2	3	4	5				M
19	S202204		A		1	2	3	4	5				M
20	S202206		A		1	2	3	4	5				M
21	S202901		A	A	1	2	3	4	5				M
22	S202902		A	A	1	2	3	4	5				M
23	S202905		A	A	5	4	3	2	1				M
24	S202908		A	A	1	2	3	4	5				M
25	S202911			A	1	2	3	4	5				M
26	S203701			B	5	3	1						M
27	S203702			B	5	3	1						M
28	S203703			B	5	3	1						M
29	S203704			C	5	3	1						M
30	S203705			B	5	3	1						M
31	S203706			B	5	3	1						M
32	S203707			B	5	3	1						M
33	S203708			C	5	3	1						M
34	S203709			C	5	3	1						M
35	S203710			C	5	3	1						M
36	S203711			B	5	3	1						M
37	S203712			C	5	3	1						M
38	S203713			B	5	3	1						M
39	S203714			B	5	3	1						M
40	S205401		F	F	5	3	1						M

Table C.8
(continued)

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
41	S205402		F	F	5	3	1						M
42	S205403		F	F	5	3	1						M
43	S205404		F	F	5	3	1						M
44	S205405		F	F	5	3	1						M
45	S205406		F	F	5	3	1						M
46	S205502	D			5	1							1
47	S205503	D			5	1							1
48	S205601	E			1	2.33	3.67	5	M				M
49	S205701	A			5	1	M						M
50	S205901	A			5	3	1						M
51	S205902	A			5	3	1						M
52	S205903	A			1	3	5						M
53	S205904	A			1	3	5						M
54	S205905	A			5	3	1						M
55	S205906	A			5	3	1						M
56	S206001		A	A	5	1							M
57	S206101	B	E	E	5	4	3	2	1				M
58	S206102	B	E	E	5	4	3	2	1				M
59	S206103	B	E	E	5	4	3	2	1				M
60	S206104	B	E	E	5	4	3	2	1				M
61	S206601			B	1	2	3	4	5				1
62	S206701	A			5	3	1						M
63	S206702	A			5	3	1						M
64	S206703	D			5	3	1						M
65	S206704	D			5	3	1						M
66	S206705	D			5	3	1						M
67	S206706	D			5	3	1						M
68	S207101	A			1	3	5						M
69	S207501		B	B	5	4	3	2	1				M
70	S207502		B	B	5	4	3	2	1				M
71	S207503		B	B	5	4	3	2	1				M
72	S207507		B	B	5	4	3	2	1				M
73	S207508		C	C	5	4	3	2	1				M
74	S207509		C	C	5	4	3	2	1				M
75	S207510		B	B	5	4	3	2	1				M
76	S207512		B		5	4	3	2	1				M
77	S207601	C			5	4	3	2	1				M
78	S207602	C			5	4	3	2	1				M
79	S207603	C			5	4	3	2	1				M
80	S207604	C			5	4	3	2	1				M

Table C.8
(continued)

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
81	S207606	C			5	4	3	2	1				M
82	S207608	E			5	4	3	2	1				M
83	S208701		E	E	5	4	3	2	1				M
84	S208801		E	E	5	1							1
85	S208802		E	E	5	1							1
86	S208803		E	E	5	1							1
87	S208804		E	E	5	1							1
88	S208805		E	E	5	1							1
89	S208806		E	E	5	1							1
90	S209001		A	A	5	1	3						M
91	S209501		A	A	5	4	3	2	1				M
92	S209509		A	A	5	4	3	2	1				M
93	S209510		A	A	5	4	3	2	1				M
94	S209511		A	A	5	4	3	2	1				M
95	S209515		A	A	5	4	3	2	1				M
96	S211003		A	A	1	2	3	4	5	M			M
97	S211008		A	A	5	4	3	2	1	M			M
98	S211013		A	A	1	2	3	4	5	M			M
99	S211305		A		5	4	3	2	1				M
100	S211401		B	B	5	4	3	2	1				M
101	S211402		B	B	5	4	3	2	1				M
102	S211403		B	B	5	4	3	2	1				M
103	S211404		C	C	5	4	3	2	1				M
104	S211405		C	C	5	4	3	2	1				M
105	S211406		C	C	5	4	3	2	1				M
106	S211407		C	C	5	4	3	2	1				M
107	S211408		C	C	5	4	3	2	1				M
108	S211410			B	5	4	3	2	1				M
109	S212001			A	5	4	3	2	1				M
110	S212004			A	5	4	3	2	1				M
111	S212006			A	5	4	3	2	1				M
112	S212008			A	5	4	3	2	1				M
113	S212101			A	5	3	1						M
114	S212102			A	5	3	1						M
115	S212103			A	1	3	5						M
116	S212104			A	1	3	5						M
117	S212105			A	5	3	1						M

Table C.9

Science WARM Variables

Grade 3/Age 9

		BLOCK	ITEM
	SW1Ax - Use of scientific apparatus		
S400101	HAVE YOU EVER USED A METER STICK	S3	1
S400102	HAVE YOU EVER USED A SCALE TO WEIGH THINGS	S3	2
S400103	HAVE YOU EVER USED A MAGNIFYING GLASS	S3	3
S400105	HAVE YOU EVER USED A THERMOMETER	S3	5
S400109	HAVE YOU EVER USED A YARDSTICK	S3	9
S400110	HAVE YOU EVER USED A CALCULATOR	S3	10
	SW1Bx - Home encouragement & support		
S401601	AT HOME DO YOU TALK ABOUT WHAT YOU LEARNED	S4	2
S401602	AT HOME DO YOU GET HELP W/SCIENCE HOMEWORK	S4	3
S401603	AT HOME DO YOU GET HELP W/SCIENCE PROJECTS	S4	4
S401604	AT HOME DOES SOMEONE SHOW YOU HOW DO SCIENCE EXP	S4	5
S401605	AT HOME DO YOU WATCH & DISCUSS SCIENCE PROGRAM	S4	6
S401607	DO YOU TALK ABOUT SCIENCE TOPICS W/SOMEONE AT HOME	S4	8
S401608	DO YOU READ SCIENCE BOOKS W/SOMEONE AT HOME	S4	9
S403201	HOW MUCH TIME SPENT ON SCIENCE HOMEWORK EACH WEEK	S6	1
	SW1Cx - Doing science using apparatus		
S400104	HAVE YOU EVER USED A TELESCOPE	S3	4
S400106	HAVE YOU EVER USED A MICROSCOPE	S3	6
S400108	HAVE YOU EVER USED A STOPWATCH	S3	8
S400301	HAVE YOU WORKED/EXPERIMENTED W/SHADOWS	S1	1
S400302	HAVE YOU WORKED/EXPERIMENTED W/LIVING PLANTS	S1	2
S400303	HAVE YOU WORKED/EXPERIMENTED W/LIVING ANIMALS	S1	3
S400304	HAVE YOU WORKED/EXPERIMENTED W/BATTERY & BULBS	S1	4
S401606	DO YOU GO TO SCIENCE MUSEUM W/SOMEONE FROM HOME	S4	7
	SW1Dx - Value placed on science		
S402101	WHEN YOU HAVE SCIENCE IN SCHOOL DO YOU LIKE IT	S4	1
S404301	WILL KNOWING A LOT ABOUT SCIENCE HELP WHEN GROWN UP	S7	7

Table C.9
(continued)

		BLOCK	ITEM
	SW1Ex - Science classroom activities		
S401501	HOW OFTEN DO YOU HAVE SCIENCE LESSON IN SCHOOL	S5	1
S401801	HOW MANY SCIENCE EXP DID YOU HAVE LAST MONTH	S5	2
S403801	HOW OFTEN DO YOU DO SCIENCE EXPERIMENTS	S6	2
S403901	HOW OFTEN DO YOU READ SCIENCE TEXTBOOK IN CLASS	S6	3

Table C.10

Science WARM Variables

Grade 7/Age 13

		BLOCK	ITEM
	SW2Ax - Value placed on science		
S400701	AGREE/DISAGREE-SCI HELPS ME UNDERSTAND MY BODY	S2	1
S400702	AGREE/DISAGREE-SCIENCE NOT USEFUL OUT OF CLASS	S2	2
S401301	SCIENCE CLASSES ARE USEFUL	S3	1
S401303	SCIENCE CLASSES SHOULD BE REQUIRED IN SCHOOL	S3	3
S401304	SCIENCE CLASSES ARE USEFUL IN EVERYDAY LIFE	S3	4
S401305	SCIENCE CLASSES WILL BE USEFUL IN THE FUTURE	S3	5
S402101	WHEN YOU HAVE SCIENCE IN SCHOOL DO YOU LIKE IT	S4	1
S402401	WILL YOU WORK IN AREA THAT REQ SCIENCE KNOWLEDGE	S7	1
S402501	HOW OFTEN IS SCIENCE CLASS BORING	S7	6
S402502	HOW OFTEN IS SCIENCE CLASS FUN	S7	7
S402503	HOW OFTEN DO YOU LOOK FORWARD TO SCIENCE CLASS	S7	8
S402701	FEEL:IMPORTANT TO KNOW SCIENCE TO GET GOOD JOB	S8	2
S402702	FEEL:WILL USE SCIENCE IN MANY WAYS WHEN AN ADULT	S8	3
S402703	FEEL:KNOWING SCIENCE WILL HELP ME EARN A LIVING	S8	4
S402704	FEEL:I DON'T EXPECT TO USE SCIENCE WHEN I GET OUT	S8	5
S402705	FEEL:SCIENCE WILL BE IMPORTANT TO ME IN MY LIFE	S8	6
	SW2Bx - Science classroom activities		
S402001	HOW OFTEN SCIENCE TEACHER LECTURE	S9	1
S402002	HOW OFTEN DOES SCI TEACHER DEMONSTRATE PRINCIPLE	S9	2
S402003	HOW OFTEN DOES SCI TEACHER ASK FOR REASONS FOR EXP	S9	3
S402004	HOW OFTEN DOES SCI TEACHER ASK YOU TO HYPOTHESIZE	S9	4
S402005	HOW OFTEN DOES SCI TEACHER ASK YOU-INTERPRET DATA	S9	5
S402301	HOW OFTEN DO YOU SOLVE SCIENCE PROBLEMS	S6	2
S402302	HOW OFTEN DO YOU DO EXPERIMENTS BY YOURSELF	S6	3
S402303	HOW OFTEN DO YOU DO EXPERIMENTS W/OTHER STUDENTS	S6	4
S402304	HOW OFTEN DO YOU WRITE UP EXPERIMENTS	S6	5
S402306	HOW OFTEN DO YOU READ ARTICLES ABOUT SCIENCE	S6	7
S402307	HOW OFTEN DO YOU DO AN ORAL OR WRITTEN REPORT	S6	8

Table C.10
(continued)

		BLOCK	ITEM
	SW2Cx - Doing science & home support		
S400901	HOW OFTEN HAVE YOU HELPED W/LITTER CLEAN-UP	S1	1
S400902	HOW OFTEN HAVE YOU SEPARATED TRASH FOR RECYCLE	S1	2
S401604	AT HOME DOES SOMEONE SHOW YOU HOW DO SCIENCE EXP	S4	5
S401605	AT HOME DO YOU WATCH & DISCUSS SCIENCE PROGRAM	S4	6
S401607	DO YOU TALK ABOUT SCIENCE TOPICS W/SOMEONE AT HOME	S4	8
S401608	DO YOU READ SCIENCE BOOKS W/SOMEONE AT HOME	S4	9
S402201	HOW OFTEN TRIED TO FIX SOMETHING ELECTRICAL	S7	2
S402203	HOW OFTEN TRIED TO FIGURE OUT UNHEALTHY PLANT	S7	4
S402204	HOW OFTEN TRIED TO FIGURE OUT UNHEALTHY ANIMAL	S7	5
	SW2Dx - Use of scientific apparatus		
S402202	HOW OFTEN TRIED TO FIX SOMETHING MECHANICAL	S7	3
S402802	HAVE YOU EVER USED A TELESCOPE	S8	8
S402803	HAVE YOU EVER USED A MICROSCOPE	S8	9
S402804	HAVE YOU EVER USED A STOPWATCH	S8	10
S402807	HAVE YOU EVER USED A STETHOSCOPE	S8	13
	SW2Ex - Application of science I		
S401201	CAN SCIENCE HELP PREVENT WORLDWIDE STARVATION	S1	3
S401202	CAN SCIENCE HELP SAVE US FROM AN ENERGY SHORTAGE	S1	4
S401203	CAN SCIENCE HELP FIND CURES FOR DISEASES	S1	5
S401206	CAN SCIENCE HELP PREVENT BIRTH DEFECTS	S1	8
S401207	CAN SCIENCE HELP SAVE OUR NATURAL RESOURCES	S1	9
S401208	CAN SCIENCE HELP REDUCE AIR & WATER POLLUTION	S1	10
S401209	CAN SCIENCE HELP REDUCE WORLD OVERPOPULATION	S1	11
	SW2Fx - Solving world problems		
S400801	CAN YOU HELP SOLVE POLLUTION	S2	4
S400802	CAN YOU HELP SOLVE ENERGY WASTE	S2	5
S400803	CAN YOU HELP SOLVE FOOD SHORTAGES	S2	6
S400804	CAN YOU HELP SOLVE OVERPOPULATION	S2	7
S400805	CAN YOU HELP SOLVE NATURAL RESOURCE SUPPLY	S2	8
S400806	CAN YOU HELP SOLVE ACCIDENTS	S2	9

Table C.10
(continued)

		BLOCK	ITEM
	SW2Gx - Application of science II		
S403101	WILL SCIENTIFIC RESEARCH ELIMINATE ACID RAIN	S9	6
S403102	WILL SCIENTIFIC RESEARCH ELIMINATE AIR POLLUTION	S9	7
S403103	WILL SCIENTIFIC RESEARCH ELIMINATE FACTORY POLLUTI	S9	8
S403104	WILL SCIENTIFIC RESEARCH ELIMINATE TOXIC WASTE	S9	9

Table C.11

Science WARM Variables

Grade 11/Age 17

		BLOCK	ITEM
	SW3Ax - Value placed on science		
S400702	AGREE/DISAGREE-SCIENCE NOT USEFUL OUT OF CLASS	S2	2
S400703	AGREE/DISAGREE-PROCEDURES GOOD ONLY IN A LAB	S2	3
S401301	SCIENCE CLASSES ARE USEFUL	S3	1
S401302	SCIENCE CLASSES ARE IRRELEVANT TO REAL WORLD	S3	2
S401303	SCIENCE CLASSES SHOULD BE REQUIRED IN SCHOOL	S3	3
S401304	SCIENCE CLASSES ARE USEFUL IN EVRYDAY LIFE	S3	4
S401305	SCIENCE CLASSES WILL BE USEFUL IN THE FUTURE	S3	5
S401901	OUTSIDE SCHOOL READ BOOKS/ARTICLES ABOUT SCIENCE	S7	1
S402101	WHEN YOU HAVE SCIENCE IN SCHOOL DO YOU LIKE IT	S4	1
S402401	WILL YOU WORK IN AREA THAT REQ SCIENCE KNOWLEDGE	S4	11
S402501	HOW OFTEN IS SCIENCE CLASS BORING	S10	12
S402502	HOW OFTEN IS SCIENCE CLASS FUN	S10	13
S402503	HOW OFTEN DO YOU LOOK FORWARD TO SCIENCE CLASS	S10	14
S402701	FEEL:IMPORTANT TO KNOW SCIENCE TO GET GOOD JOB	S11	5
S402702	FEEL:WILL USE SCIENCE IN MANY WAYS WHEN AN ADULT	S11	6
S402703	FEEL:KNOWING SCIENCE WILL HELP ME EARN A LIVING	S11	7
S402704	FEEL:I DON'T EXPECT TO USE SCIENCE WHEN I GET OUT	S11	8
S402705	FEEL:SCIENCE WILL BE IMPORTANT TO ME IN MY LIFE	S11	9
	SW3Bx - Application of science I		
S401201	CAN SCIENCE HELP PREVENT WORLDWIDE STARVATION	S1	3
S401202	CAN SCIENCE HELP SAVE US FROM AN ENERGY SHORTAGE	S1	4
S401206	CAN SCIENCE HELP PREVENT BIRTH DEFECTS	S1	8
S401207	CAN SCIENCE HELP SAVE OUR NATURAL RESOURCES	S1	9
S401208	CAN SCIENCE HELP REDUCE AIR & WATER POLLUTION	S1	10
S401209	CAN SCIENCE HELP REDUCE WORLD OVERPOPULATION	S1	11
S402902	SHOULD SCIENTIST RECEIVE $ STUDY:AIR POLLUTION	S9	2
S402904	SHOULD SCIENTIST RECEIVE $ STUDY:ENERGY PROBLEM	S9	4
S402906	SHOULD SCIENTIST RECEIVE $ STUDY:POPULATION PROBLE	S9	6
S402908	SHOULD SCIENTIST RECEIVE $ STUDY:SOLAR ENERGY	S9	8

Table C.11
(continued)

		BLOCK	ITEM
	SW3Cx - Science & math background		
B005401	WHICH DESCRIBES YOUR GRADES SO FAR	B1	39
NCOMP	NUMBER OF COMPUTER COURSES TAKEN	(ETS COMPOSITE)	
NMATH	HIGHEST LEVEL OF MATH COURSE TAKEN	(ETS COMPOSITE)	
NSCI	HIGHEST LEVEL OF SCIENCE COURSE TAKEN	(ETS COMPOSITE)	
S403306	HOW MUCH HAVE YOU STUDIED:CHEMISTRY	S10	6
S403308	HOW MUCH HAVE YOU STUDIED:PHYSICS	S10	8
S403401	HAVE YOU TAKEN MORE SCIENCE COURSES THAN REQUIRED	S10	11
	SW3Dx - Science interest & application		
S400801	CAN YOU HELP SOLVE POLLUTION	S2	4
S400802	CAN YOU HELP SOLVE ENERGY WASTE	S2	5
S400805	CAN YOU HELP SOLVE NATURAL RESOURCE SUPPLY	S2	8
S401902	OUTSIDE SCHOOL READ BOOKS ABOUT SCIENTISTS	S7	2
S401910	OUTSIDE SCHOOL TALK ABOUT SCIENCE TOPIC W/FRIENDS	S7	10
S401911	OUTSIDE SCHOOL LISTEN TO TALKS ABOUT SCIENCE	S7	11
S402306	HOW OFTEN DO YOU READ ARTICLES ABOUT SCIENCE	S6	7
	SW3Ex - Science classroom activities		
S402001	HOW OFTEN SCIENCE TEACHER LECTURE	S8	1
S402002	HOW OFTEN DOES SCI TEACHER DEMONSTRATE PRINCIPLE	S8	2
S402003	HOW OFTEN DOES SCI TEACHER ASK FOR REASONS FOR EXP	S8	3
S402004	HOW OFTEN DOES SCI TEACHER ASK YOU TO HYPOTHESIZE	S8	4
S402005	HOW OFTEN DOES SCI TEACHER ASK YOU-INTERPRET DATA	S8	5
S402301	HOW OFTEN DO YOU SOLVE SCIENCE PROBLEMS	S6	2
S402302	HOW OFTEN DO YOU DO EXPERIMENTS BY YOURSELF	S6	3
S402303	HOW OFTEN DO YOU DO EXPERIMENTS W/OTHER STUDENTS	S6	4
S402304	HOW OFTEN DO YOU WRITE UP EXPERIMENTS	S6	5
S402305	HOW OFTEN DO YOU READ YOUR TEXTBOOK	S6	6
S402307	HOW OFTEN DO YOU DO AN ORAL OR WRITTEN REPORT	S6	8
	SW3Fx - Science background		
S401401	SHOULD SCI EXPERIMENT ON PEOPLE W/O APPROVAL	S3	6
S401404	SHOULD SCI CONTROL THE WAY PEOPLE ACT	S3	9
S402802	HAVE YOU EVER USED A TELESCOPE	S9	11
S402804	HAVE YOU EVER USED A STOPWATCH	S9	13
S402807	HAVE YOU EVER USED A STETHOSCOPE	S9	16
S403301	HOW MUCH HAVE YOU STUDIED:GENERAL SCIENCE	S10	1
S403302	HOW MUCH HAVE YOU STUDIED:LIFE SCIENCE	S10	2

Table C.11
(continued)

		BLOCK	ITEM
	SW3Gx - Miscellaneous		
B003901	HOW MUCH TIME EACH DAY IS SPENT ON HOMEWORK	B1	14
S401602	AT HOME DO YOU GET HELP W/SCIENCE HOMEWORK	S4	4
S401905	OUTSIDE SCHOOL FIX SOMETHING MECHANICAL	S7	5
S402201	HOW OFTEN TRIED TO FIX SOMETHING ELECTRICAL	S11	1
S402202	HOW OFTEN TRIED TO FIX SOMETHING MECHANICAL	S11	2
S402808	HAVE YOU EVER USED AN ELECTRICITY METER	S9	17
S403501	DO YOU USE SCI INFO TO DECIDE WHAT FOOD TO EAT	S7	13
S403502	DO YOU USE SCI INFO TO KEEP HEALTHY	S7	14
	SW3Hx - Application of science II		
S403101	WILL SCIENTIFIC RESEARCH ELIMINATE ACID RAIN	S8	6
S403102	WILL SCIENTIFIC RESEARCH ELIMINATE AIR POLLUTION	S8	7
S403103	WILL SCIENTIFIC RESEARCH ELIMINATE FACTORY POLLUTI	S8	8
S403104	WILL SCIENTIFIC RESEARCH ELIMINATE TOXIC WASTE	S8	9
S403105	WILL SCIENTIFIC RESEARCH ELIMINATE ENERGY SUPPLY	S8	10
S403106	WILL SCIENTIFIC RESEARCH ELIMINATE LACK OF FOOD	S8	11

Table C.12

Derivation of Science WARM Scores

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
1	B003901			G	M	1	2	3	4	5			M
2	B005401			C	5	4.43	3.86	3.29	2.71	2.14	1.57	1	M
3	NCOMP			C	1	3	5						M
4	NMATH			C	1	2	3	4	5	M			M
5	NSCI			C	1	2.33	3.67	5	M				M
6	S400101	A			5	1	1						1
7	S400102	A			5	1	1						1
8	S400103	A			5	1	1						1
9	S400104	C			5	1	1						1
10	S400105	A			5	1	1						1
11	S400106	C			5	1	1						1
12	S400108	C			5	1	1						1
13	S400109	A			5	1	1						1
14	S400110	A			5	1	1						1
15	S400301	C			5	1	1						1
16	S400302	C			5	1	1						1
17	S400303	C			5	1	1						1
18	S400304	C			5	1	1						1
19	S400701		A		5	4	3	2	1				M
20	S400702		A	A	1	2	3	4	5				M
21	S400703			A	1	2	3	4	5				M
22	S400801		F	D	5	4	3	2	1				M
23	S400802		F	D	5	4	3	2	1				M
24	S400803		F		5	4	3	2	1				M
25	S400804		F		5	4	3	2	1				M
26	S400805		F	D	5	4	3	2	1				M
27	S400806		F		5	4	3	2	1				M
28	S400901		C		5	3.67	2.33	1					M
29	S400902		C		5	3.67	2.33	1					M
30	S401201		E	B	1	3	5						M
31	S401202		E	B	1	3	5						M
32	S401203		E		1	3	5						M
33	S401206		E	B	1	3	5						M
34	S401207		E	B	1	3	5						M
35	S401208		E	B	1	3	5						M
36	S401209		E	B	1	3	5						M
37	S401301		A	A	5	4	3	2	1				M
38	S401302			A	1	2	3	4	5				M
39	S401303		A	A	5	4	3	2	1				M
40	S401304		A	A	5	4	3	2	1				M

Table C.12
(continued)

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
41	S401305		A	A	5	4	3	2	1				M
42	S401401			F	1	2	3	4	5				M
43	S401404			F	1	2	3	4	5				M
44	S401501	E			5	4	3	2	1				M
45	S401601	B			5	1							1
46	S401602	B		G	5	1							1
47	S401603	B			5	1							1
48	S401604	B	C		5	1							1
49	S401605	B	C		5	1							1
50	S401606	C			5	1							1
51	S401607	B	C		5	1							1
52	S401608	B	C		5	1							1
53	S401801	E			1	1.80	2.60	3.40	4.20	5			M
54	S401901			A	5	1							M
55	S401902			D	5	1							M
56	S401905			G	1	5							M
57	S401910			D	5	1							M
58	S401911			D	5	1							M
59	S402001		B	E	5	4	3	2	1				M
60	S402002		B	E	5	4	3	2	1				M
61	S402003		B	E	5	4	3	2	1				M
62	S402004		B	E	5	4	3	2	1				M
63	S402005		B	E	5	4	3	2	1				M
64	S402101	D	A	A	5	1	M						M
65	S402201		C	G	5	3.67	2.33	1					M
66	S402202		D	G	5	3.67	2.33	1					M
67	S402203		C		5	3.67	2.33	1					M
68	S402204		C		5	3.67	2.33	1					M
69	S402301		B	E	5	4	3	2	1				M
70	S402302		B	E	5	4	3	2	1				M
71	S402303		B	E	5	4	3	2	1				M
72	S402304		B	E	5	4	3	2	1				M
73	S402305			E	5	4	3	2	1				M
74	S402306		B	D	5	4	3	2	1				M
75	S402307		B	E	5	4	3	2	1				M
76	S402401		A	A	5	1	3						M
77	S402501		A	A	1	2	3	4	5				M
78	S402502		A	A	5	4	3	2	1				M
79	S402503		A	A	5	4	3	2	1				M
80	S402701		A	A	5	4	3	2	1				M

Table C.12
(continued)

		COHORT			RESPONSES								
		1	2	3	1	2	3	4	5	6	7	8	MISS
81	S402702		A	A	5	4	3	2	1				M
82	S402703		A	A	5	4	3	2	1				M
83	S402704		A	A	1	2	3	4	5				M
84	S402705		A	A	5	4	3	2	1				M
85	S402802		D	F	5	1							M
86	S402803		D		5	1							M
87	S402804		D	F	5	1							M
88	S402807		D	F	5	1							M
89	S402808			G	1	5							M
90	S402902			B	5	3.67	2.33	1					M
91	S402904			B	5	3.67	2.33	1					M
92	S402906			B	5	3.67	2.33	1					M
93	S402908			B	5	3.67	2.33	1					M
94	S403101		G	H	5	3	1						M
95	S403102		G	H	5	3	1						M
96	S403103		G	H	5	3	1						M
97	S403104		G	H	5	3	1						M
98	S403105			H	5	3	1						M
99	S403106			H	5	3	1						M
100	S403201	B			1	2.33	3.67	5	M				M
101	S403301			F	5	3.67	2.33	1					M
102	S403302			F	5	3.67	2.33	1					M
103	S403306			C	5	3.67	2.33	1					M
104	S403308			C	5	3.67	2.33	1					M
105	S403401			C	5	1	M						M
106	S403501			G	5	1							M
107	S403502			G	5	1							M
108	S403801	E			5	3.67	2.33	1	M				M
109	S403901	E			5	3.67	2.33	1	M				M
110	S404301	D			5	1	M						M

APPENDIX D

The IRT Linking Procedures Used to Place the 1986 Intermediary Scaling Results onto the 1984 Reading Calibration Scale

Appendix D

THE IRT LINKING PROCEDURE USED TO PLACE THE 1986 INTERMEDIARY SCALING RESULTS ONTO THE 1984 READING CALIBRATION SCALE

Kathleen M. Sheehan

Educational Testing Service

The item calibration program employed by NAEP resolves the indeterminacy of scale inherent in the three-parameter logistic model by standardizing the distribution of proficiency in the calibration sample. As a result, intermediary scaling results, such as item parameters and conditional effects, are obtained on a scale that is approximately centered at zero, has a standard deviation of one, and typically spans a region lying somewhere between -4.0 and 4.0. In 1984, NAEP elected to report the final results of the reading assessment on an alternative scale that was selected for ease of interpretation. The relationship between the alternative scale, called the RP scale, and the scale established by the calibration of the 1984 spiralled reading data, called the 1984 reading calibration scale, is virtually linear for proficiencies in the region bounded by -4.0 and 4.0. Thus, scaling results reported on the RP scale can be reexpressed on the 1984 reading calibration scale by applying an appropriate linear transformation.

Because the RP scale was primarily developed to enhance the interpretability of the final scaling results of the 1984 reading assessment, only the final assessment results were reported on that scale. The intermediary results, such as item parameters and conditional effects, were reported on the 1984 reading calibration scale. This practice of reporting intermediary scaling results on a calibration scale and final scaling results on a specially selected reporting scale was repeated for all of the subject areas assessed in 1986. For example, the mathematics and science item parameters are reported on the 1986 mathematics calibration scale and the 1986 science calibration scale, respectively.

To facilitate year-to-year comparisons, the 1986 reading calibration scale was equated to the 1984 reading calibration scale and all of the intermediary results of the 1986 reading assessment were reported on the 1984 reading calibration scale. The IRT linking procedure that was used to equate the two scales and the jackknife procedure that was used to approximate the equating error are documented in this appendix.

TYPES OF IRT LINKING PROCEDURES

Item parameter estimates obtained from independent item calibrations can be placed onto a common scale by estimating an appropriate linking transformation. Two commonly used procedures for estimating IRT linking transformations are common item equating and equivalent population equating. Common item equating procedures are used when the scales to be equated contain overlapping subsets of items that were administered to independent samples of examinees drawn from (possibly) different populations. Equivalent population equating procedures are used when the scales to be equated contain nonoverlapping subsets of items that were administered to independent samples of examinees drawn from equivalent populations.

Since introducing scale-score reporting in 1984, NAEP has had occasion to use both of the linking procedures described above. In 1984, NAEP used an equivalent population equating procedure to link the scale established by the calibration of the paced reading data and the scale established by the calibration of the spiralled reading data. The equivalent population procedure could be used because, at each age level, the sample of students who received paced booklets was constructed to be randomly equivalent to the sample of students who received spiralled booklets. Note that although the paced and spiralled booklets contained many of the same items, those items did not qualify as common items because they were administered under different conditions and the difference in conditions was expected to be related to reading proficiency. The equivalent population procedure used to link the paced and spiralled scales is documented in Beaton (1987a).

NAEP's first use of common item equating occurred in 1986 at the time that the 1986 reading calibration scale was equated to the 1984 reading calibration scale. The particular procedures used for that equating are documented in this appendix.

Note that the reading trend analysis documented in Beaton (1987a) did not involve any scale equating because the 1984 reading data and the reading trend data from all previous years were calibrated simultaneously.

THE IRT LINKING PROCEDURE USED TO EQUATE THE 1984 AND 1986 CALIBRATION SCALES

As in the 1984 assessment, the 1986 reading results were calibrated with the BILOG program (Mislevy & Bock, 1982). The calibration included a total of 107 cognitive reading items, 76 of which were common to the 1984 assessment and 31 of which were administered for the first time in 1986. Although appropriately scaled item parameters were already available for the 76 common items and those parameters were used in all subsequent calculations, these items were recalibrated with the 1986 data so that a second set of item parameters might be obtained. The two sets of item parameters available for the common items were then used to define an appropriate linking transformation.

As is typical in a BILOG calibration, the 1986 item parameters were obtained on a provisional scale that was determined by standardizing the distribution of proficiency in the calibration sample. (The calibration sample included students from three age groups: grade 3/age 9, grade 7/age 13, and grade 11/age 17.)

The Stocking-Lord linking procedure (Stocking & Lord, 1983), as implemented in the TBLT program (Stocking, 1986), was used to estimate the linking transformation needed to reexpress the 1986 intermediary scaling results on the 1984 calibration scale.

The input data for the Stocking-Lord procedure consists of two sets of estimated item parameters, one set expressed on a target scale, and one set expressed on a provisional scale. In the application documented here, the 1984 reading calibration scale is the target scale and the 1986 reading calibration scale is the provisional scale. The output of the Stocking-Lord procedure is the parameter estimates, A and B, of the linear transformation that describes the relationship between the IRT item parameter estimates expressed on the provisional scale and those expressed on the target scale. That is

$$a_j = A^{-1} a_j^P$$

$$b_j = A\, b_j^P + B$$

$$c_j = c_j^P$$

where (a_j^P, b_j^P, c_j^P) and (a_j, b_j, c_j) for $j=1,\ldots n$ are the IRT item parameter estimates obtained for the common items expressed on the provisional and target scales, respectively. Note that the lower asymptote parameters, c_j^P, are unaffected by the transformation.

The parameters of the linear transformation, A and B, are found by minimizing the squared difference between estimated true scores (expected numbers correct on the n common items) at N preselected proficiency values $\theta=[\theta_1,\ldots\theta_N]$. The function that is minimized is

$$f(A,B) = 1/N \sum_{i=1}^{N} \{\zeta^T(1,0,\theta_i) - \zeta^P(A,B,\theta_i)\}^2$$

where $\zeta^T(1,0,\theta_i)$ is the estimated true score associated with the proficiency level θ_i, calculated from the item parameters expressed on the target scale, and $\zeta^P(A,B,\theta_i)$ is the estimated true score associated with the proficiency level θ_i calculated from the item parameters that were originally estimated on the provisional scale and then reexpressed on the target scale, that is

$$\zeta^P(A,B,\theta_i) = \sum_{j=1}^{n} c_j + (1-c_j)/\{1+\exp[-1.7(A^{-1}a_j^P)(\theta_i-(Ab_j^P+B))]\} ,$$

where a_j^P and b_j^P are the estimated discrimination and difficulty parameters for item j, expressed on the provisional scale. The values $\theta=[\theta_1,\theta_2,\ldots\theta_N]$ are typically selected to span that region of the target scale which is expected to be most dense. For the current application, 200 equally spaced values between -2.0 and 2.0 were used.

The success of the equating was evaluated by comparing estimated item difficulties and test characteristic curves calculated from the common items. The comparison of item difficulties (b parameters) is provided in Figure D.1. The transformed 1986 values are plotted on the vertical axis, the corresponding 1984 values are plotted on the horizontal axis. The plot shows that the parameter estimates obtained from the TBLT run have provided an adequate fit to the data.

The test characteristic curve provides the expected proportion of items passed as a function of examinee proficiency. Figure D.2 presents test characteristic curves calculated for the test defined by the 76 common items only. The curve defined by the item parameters that were estimated from the 1984 data is plotted as a solid line. The curve defined by the item parameters that were estimated from the 1986 data is plotted as a dashed line. The comparison indicates that, at almost all proficiency levels, the linking transformation has been successful at preserving the expected proportion of items passed. The difference in the curves at the lower asymptote reflects the fact that the guessing parameters, c_j, are generally not well estimated.

Based on the results given above, it was decided that all intermediary scaling results, such as item parameters and conditional effects, could be placed onto the 1984 calibration scale by applying the linking transformation that was obtained from the TBLT run. Note however that only the 31 items that were first administered in 1986 needed to be transformed. For the 76 common items, item parameters expressed on the 1984 calibration scale were already available and so no rescaling was required.

THE UNCERTAINTY OF THE LINKING PROCEDURES

The uncertainty associated with the parameter estimates A and B of the linking transformation was approximated using a jackknife procedure (Mosteller & Tukey, 1977). The procedure consisted of three steps. First, the 76 items that were used to estimate the transformation were classified into 10 subsets with approximately equal average difficulty. (Six subsets contained eight items and four subsets contained seven items.) Second, the TBLT program was rerun 10 times. Each rerun included all but one of the subsets created in step 1. Finally, the observed variation among the A and B parameter estimates obtained from the 10 TBLT reruns was used to estimate a covariance matrix which quantifies uncertainty due to (i) the imprecision of the estimated item parameters and (ii) lack of fit from the IRT model. The results of this analysis are given in Table D.1.

In considering the magnitude of the variance estimates given in Table D.1, recall that the jackknife procedure measures variation arising from two different sources: estimation error and model misfit. The magnitude of the uncertainty due to estimation error is related to the size of the calibration samples--larger calibration samples tend to provide more precise linking

Figure D.1

Comparison of Item Difficulties for 76 Common Items
1986 b's vs. 1984 b's

Scale - 1984 Calibration Scale

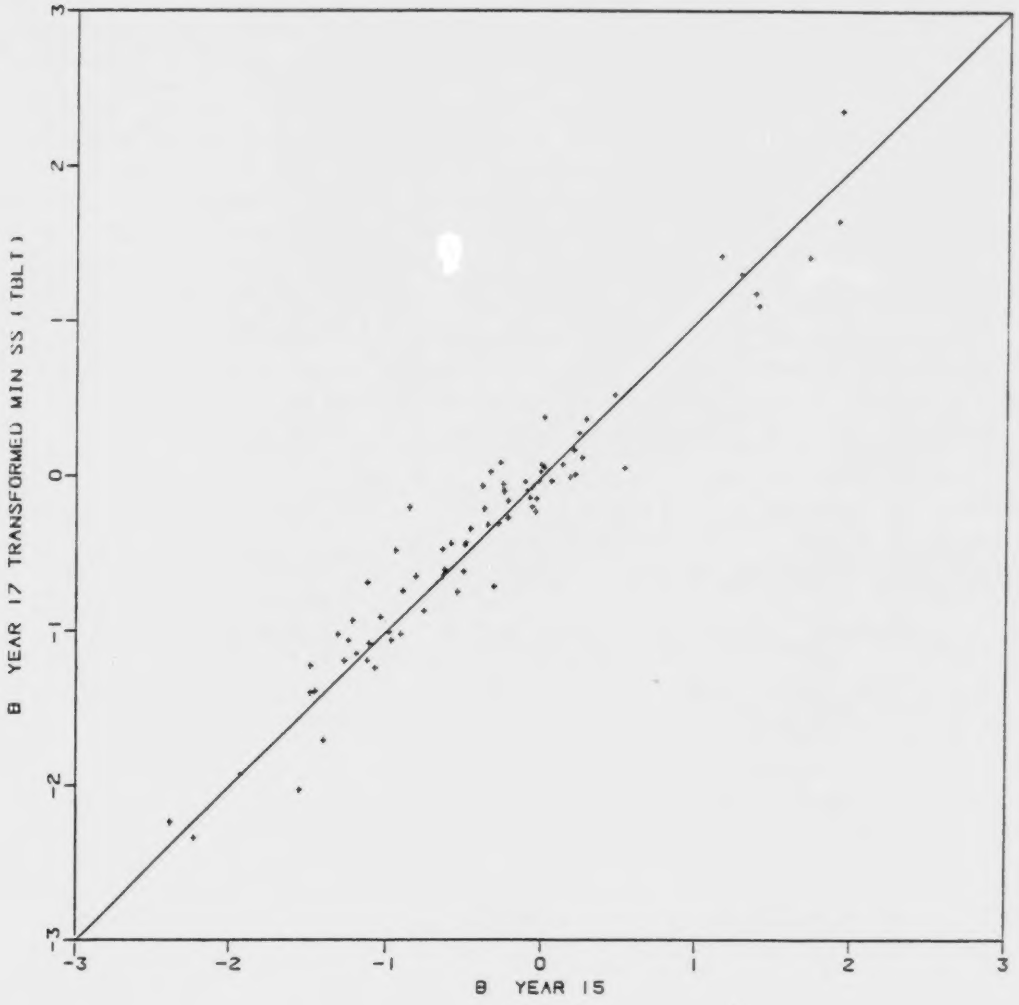


Figure D.2

Comparison of Test Characteristic Curves for 76 Common Items

1984 Curve - Solid Line

1986 Curve - Dashed Line

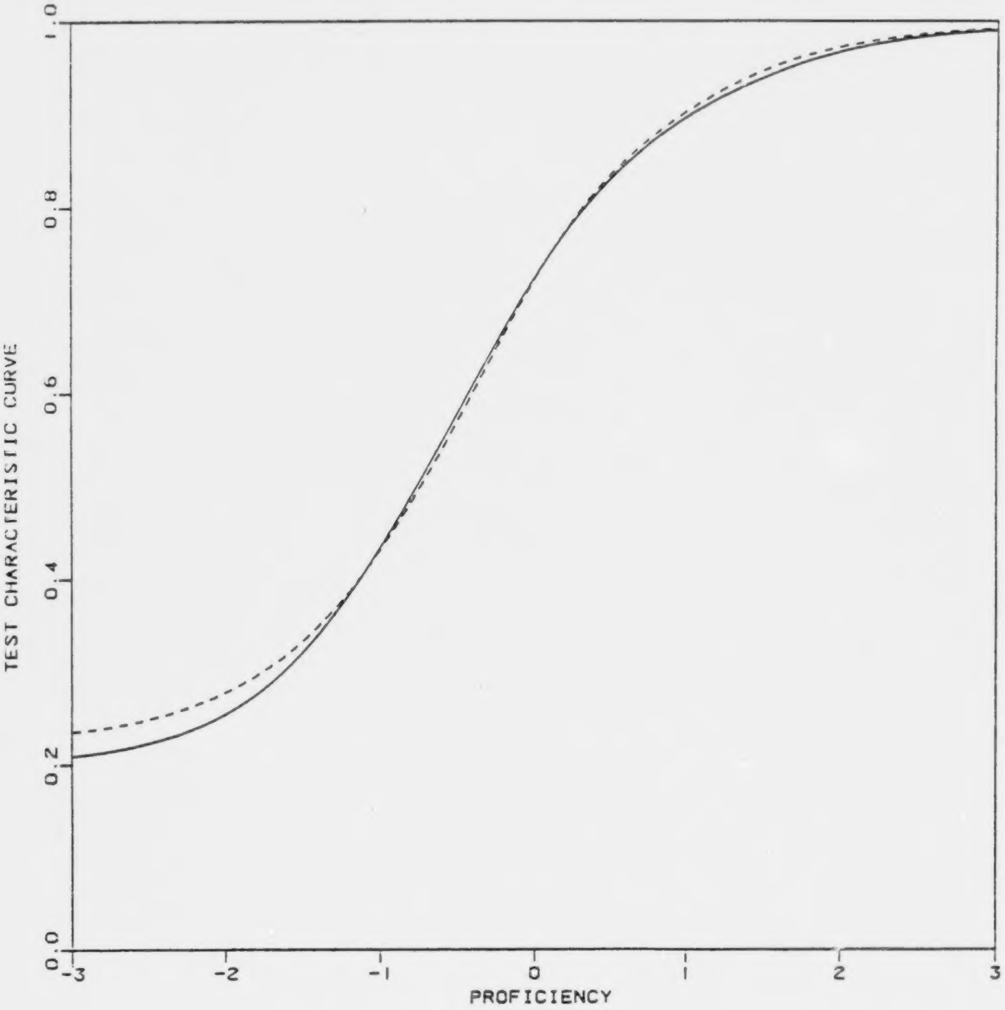


Table D.1

Results of the Jackknife Approximation for the Stocking-Lord Linking Procedure

Run*	Items	A	B
0	76	1.122196	-0.442910
1	68	1.118018	-0.449670
2	68	1.126296	-0.447837
3	68	1.121856	-0.449472
4	68	1.110982	-0.433893
5	68	1.114703	-0.426793
6	68	1.128065	-0.430320
7	69	1.125834	-0.446748
8	69	1.128753	-0.440663
9	69	1.112862	-0.447648
10	69	1.135424	-0.455858

Parameter	Jackknife Estimate
σ^2_A	0.00512
σ^2_B	0.00740
σ_{AB}	-0.00238

---

* The parameter estimates, A and B, obtained from Run 0 were used to transform the item parameters estimated from the 1986 data from the metric of the 1986 calibration scale to the metric of the 1984 calibration scale. The parameter estimates, A and B, obtained from Runs 1 through 10 were used only to estimate the uncertainty of the linking procedure.

parameter estimates. The magnitude of the uncertainty due to model misfit is related to the number of linking items used to define the transformation. To see this, note that if the IRT model were correct, the difference between sets of (a,b,c) estimates obtained from increasingly large samples of examinees would be accounted for totally by a linear transformation. In this case, precise estimates of the linking parameters could be obtained with as few as two linking items. When the IRT model does not fit, however, different sets of linking items will tend to provide different estimates of the linking parameters even as the calibration sample sizes increase without bound. In this latter case, it is clear that the model misfit component of uncertainty can only be reduced by increasing the number of linking items. Moreover, the linking items should be chosen so as to be representative of the set of all items that might have been used to estimate the linking function.

Because the linking transformation described in this appendix was used only to transform intermediary scaling results, the variance estimates given in Table D.1 are not particularly interesting. However, if the final results of the reading assessment had been reported on the same scale as was used in 1984, as may be the case in future reading assessments, then these types of variance estimates could be used to account for equating error when estimating standard errors for statistics measuring year-to-year changes in individual or group performance.

Some consequences of the uncertainty associated with the Stocking-Lord linking procedure are reported in Sheehan and Mislevy (1988). In particular it is shown that the effects of linking procedure uncertainty will usually be negligible for inferences drawn about individuals but can be quite substantial for inferences based on aggregate statistics such as group means.

Because the plausible values methodology used to scale the NAEP data does not allow for inferences at the individual level, the issue of the consequences of uncertainty for individual inferences will not be addressed in this appendix.

The following section provides a detailed description of a procedure that can be used to account for linking procedure uncertainty when drawing inferences about aggregate statistics such as changes in group means.

THE CONSEQUENCES OF UNCERTAINTY FOR INFERENCES ABOUT GROUP MEANS

Consider the problem of estimating the change in mean reading proficiency for a particular population subgroup over the two year period from 1984 to 1986. Let $\hat{\mu}_{84}$ represent the estimated mean reading proficiency of that subgroup calculated from the 1984 scaling results expressed on the 1984 calibration scale. Let $\hat{\mu}_{86}$ represent the estimated mean reading proficiency for that same subgroup calculated from the 1986 scaling results expressed on the 1986 calibration scale and let $\hat{\mu}_{86r}$ represent the 1986 mean reexpressed on the 1984 calibration scale. Since $\hat{\mu}_{84}$ and $\hat{\mu}_{86r}$ are both expressed on the same scale, an estimate of the change from 1984 to 1986 can be obtained from the difference, $D=\hat{\mu}_{86r}-\hat{\mu}_{84}$. If it is assumed that the parameters of the linking transformation are known without error, then the standard error of this estimate is given by

$$SE(D) = SE(\hat{\mu}_{86r} - \hat{\mu}_{84}) = (\sigma^2_{86r} + \sigma^2_{84})^{1/2} \qquad (1)$$

where σ_{84} is the standard error of $\hat{\mu}_{84}$ expressed on the 1984 scale, and σ_{86r} is the standard error of $\hat{\mu}_{86r}$ expressed on the equated 1986 scale.

To account for the uncertainty of the linking procedure used to reexpress the 1986 results on the 1984 scale, note that $\hat{\mu}_{86r} = A\,\hat{\mu}_{86} + B$ and the standard error of $\hat{\mu}_{86}$, denoted σ_{86}, is not affected by the uncertainty of the linking procedure.

A large sample approximation for the desired standard error can be obtained by first defining a covariance matrix for $[\hat{\mu}_{86}, A, B]$ as follows

$$\Sigma = \begin{bmatrix} \sigma^2_{86} & 0 & 0 \\ 0 & \sigma^2_{A} & \sigma_{AB} \\ 0 & \sigma_{AB} & \sigma^2_{B} \end{bmatrix}$$

where σ_A, σ_B, and σ_{AB} quantify estimation variation for the parameters A and B of the linking transformation. (The quantities σ_A, σ_B, and σ_{AB} can be approximated using the jackknife procedure that was given in the previous section.) Second, note that

$$\begin{aligned} Var(\hat{\mu}_{86r}) &= Var(\hat{A}\hat{\mu}_{86}+\hat{B}) \\ &= Var(g(\hat{\mu}_{86}, \hat{A}, \hat{B})) \\ &= \left[\frac{\partial(g)}{\partial\mu_{86}}, \frac{\partial(g)}{\partial A}, \frac{\partial(g)}{\partial B} \right] \Sigma \left[\frac{\partial(g)}{\partial\mu_{86}}, \frac{\partial(g)}{\partial A}, \frac{\partial(g)}{\partial B} \right]' \\ &= [\ A,\ \mu_{86},\ 1\ ]\ \Sigma\ [\ A,\ \mu_{86},\ 1\ ]' \\ &= A^2\sigma^2_{86} + (\mu_{86})^2\sigma^2_{86} + 2\mu_{86}\sigma_{AB} + \sigma^2_{B} \\ &= f(\mu_{86}, A, \Sigma) \\ &\approx f(\hat{\mu}_{86}, \hat{A}, \Sigma) \ . \qquad (2) \end{aligned}$$

Thus, the uncertainty associated with the linking procedure can be accounted for in the estimated standard error of the difference as follows

$$\begin{aligned} SE(D) &= SE(\hat{\mu}_{86r} - \hat{\mu}_{84}) \\ &= (\ Var(\hat{\mu}_{86r}) + \sigma^2_{84})^{1/2} \\ &= (f(\hat{\mu}_{86}, \hat{A}, \Sigma) + \sigma^2_{84})^{1/2} \end{aligned} \tag{3}$$

where $f(\hat{\mu}_{86}, \hat{A}, \Sigma)$ is given as in (2).

A NUMERICAL ILLUSTRATION

Mean reading proficiencies for students aged 9, 13, and 17 in 1984 and 1986 are given in Table D.2. The first row of the table provides 1984 age group means expressed on the 1984 calibration scale. The second and third rows provide 1986 age group means expressed on the 1986 calibration scale and the 1984 calibration scale. The table also provides estimated standard errors for each mean.

Table D.2
Mean Reading Proficiencies
With Standard Errors in Parentheses

Year	Scale	Age 9	Age 13	Age 17
1984	84 Calib.	-0.752(.020)	0.150(.014)	0.766(.018)
1986	86 Calib.	-0.375(.025)	0.571(.019)	0.874(.018)
1986	84 Calib.	-0.864(.028)	0.198(.022)	0.538(.020)

The change in mean reading proficiency from 1984 to 1986 is given in Table D.3. The two different methods available for calculating the standard errors of these statistics are compared in Table D.4. To put these results in perspective, Table D.5 provides the change in mean reading proficiency expressed in standard error units. The table shows, for example, that the decrease in the mean reading proficiency of 9-year-olds is approximately three standard errors when the uncertainty of the linking procedure is not accounted for, but only one standard error when it is.

Table D.3
The Change in Mean Reading Proficiency from 1984 to 1986

Scale	Age 9	Age 13	Age 17
84 Calib.	-0.112	0.048	-0.228

Table D.4

Approximate Standard Errors for the Change in Mean Reading Proficiency from 1984 to 1986

Method*	Age 9	Age 13	Age 17
Excl. Eq. Error	.034	.026	.027
Incl. Eq. Error	.105	.084	.066

Table D.5

The Change in Mean Reading Proficiency from 1984 to 1986 Expressed in Standard Error Units

Standard Error*	Age 9	Age 13	Age 17
Excl. Eq. Error	-3.29	1.85	-8.44
Incl. Eq. Error	-1.07	.57	-3.45

---

* Excl. Eq. Error refers to the method that assumes that the linking function is known without error, as in equation (1); Incl. Eq. Error refers to the method that accounts for the uncertainty of the linking procedure as in equation (3).

APPENDIX E

IRT Item Parameter Tables

Appendix E

IRT ITEM PARAMETER TABLES

Appendix E contains 36 tables of IRT parameters for NAEP items used in IRT scaling for each grade/age or age.

For each NAEP item (FIELD), the tables show the BLOCK in which the item appears (for the grade/age or age), the order in which the item appears within the block (ITEM), the corresponding IRT parameters (A, B, and C), the standard error (SE) for each parameter, and a short ITEM DESCRIPTION.

Tables E.1 through E.28 show, for each grade/age, IRT parameters for reading items, mathematics items (by subscale), and science items (by subscale). Tables E.29 and E.30 present IRT parameters for grade 11/age 17 for U.S. history items and literature items, respectively.

Tables E.31 through E.36 show IRT parameters for ages 9, 13, and 17 for items used in mathematics and science trend scaling.

Note that item parameters shown in this appendix are in the metrics used for the original calibration of the scale or subscale. The transformations needed to represent these parameters in terms of the metric of the final reporting scales are given in Chapters 9, 10, 11, and 13, respectively, for reading, mathematics, science, and history and literature.

Table E.1
1986 IRT Parameters, Reading, Grade 3/Age 9

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
*N010401	R1	12	0.715	(0.087)	-1.487	(0.209)	0.219	(0.077)
*N010402	R1	13	0.928	(0.171)	0.132	(0.113)	0.222	(0.037)
*N010403	R1	14	1.031	(0.197)	0.465	(0.153)	0.190	(0.027)
*N008901	R1	15	1.328	(0.106)	-1.244	(0.138)	0.148	(0.041)
*N008902	R1	16	1.258	(0.102)	-1.271	(0.140)	0.156	(0.043)
*N001501	R1	17	1.808	(0.130)	-1.313	(0.152)	0.225	(0.047)
*N001502	R1	18	1.643	(0.098)	-0.507	(0.061)	0.182	(0.026)
*N001503	R1	19	1.345	(0.088)	-0.902	(0.086)	0.207	(0.043)
*N001504	R1	20	1.448	(0.089)	-0.650	(0.068)	0.173	(0.032)
*N014201	R1	21	1.207	(0.134)	-1.218	(0.189)	0.136	(0.052)
*N010301	R2	10	0.702	(0.085)	-2.383	(0.318)	0.248	(0.093)
*N009801	R2	11	1.396	(0.134)	-2.227	(0.296)	0.259	(0.086)
*N013301	R2	12	1.232	(0.161)	-1.557	(0.268)	0.253	(0.077)
*N009401	R2	13	1.882	(0.127)	-1.402	(0.172)	0.105	(0.036)
*N002001	R2	14	1.197	(0.065)	-0.013	(0.050)	0.131	(0.020)
*N002002	R2	15	1.444	(0.084)	-0.042	(0.055)	0.203	(0.020)
*N002003	R2	16	1.583	(0.093)	-0.229	(0.054)	0.224	(0.022)
*N002801	R2	17	1.921	(0.114)	-0.767	(0.081)	0.175	(0.028)
*N002802	R2	18	1.896	(0.110)	-0.912	(0.092)	0.143	(0.028)
*N004101	R2	19	1.096	(0.087)	-1.122	(0.114)	0.229	(0.054)
*N010201	R2	20	1.243	(0.121)	-1.932	(0.245)	0.244	(0.078)
*N010501	R3	8	2.023	(0.139)	-1.490	(0.190)	0.204	(0.046)
*N010502	R3	9	1.204	(0.114)	-1.196	(0.154)	0.156	(0.049)
*N010503	R3	10	1.455	(0.123)	-1.460	(0.184)	0.159	(0.048)
*N010504	R3	11	2.300	(0.166)	-1.114	(0.174)	0.182	(0.032)
*N003101	R3	12	1.571	(0.100)	-0.645	(0.073)	0.267	(0.032)
*N003102	R3	13	1.530	(0.083)	-0.359	(0.051)	0.145	(0.023)
*N003104	R3	14	0.704	(0.042)	1.923	(0.124)	0.0	(0.0)
*N008601	R3	15	1.789	(0.179)	-0.972	(0.171)	0.169	(0.037)
*N008602	R3	16	1.368	(0.179)	-0.554	(0.122)	0.261	(0.041)
*N008603	R3	17	1.206	(0.118)	-0.985	(0.137)	0.140	(0.043)
N021101	R4	5	0.800	(0.024)	-2.200	(0.064)	0.214	(0.021)
N021102	R4	6	0.760	(0.030)	-1.407	(0.050)	0.188	(0.015)
N021103	R4	7	1.271	(0.038)	-1.461	(0.050)	0.181	(0.015)
N021301	R4	8	1.081	(0.024)	-0.168	(0.019)	0.0	(0.0)
N021303	R4	10	0.994	(0.031)	-0.745	(0.024)	0.190	(0.010)
N021304	R4	11	0.446	(0.017)	0.397	(0.037)	0.172	(0.008)
N021305	R4	12	0.978	(0.024)	0.214	(0.028)	0.189	(0.007)
N021201	R4	13	0.861	(0.024)	-0.120	(0.023)	0.180	(0.008)
N021202	R4	14	0.628	(0.021)	-0.153	(0.022)	0.195	(0.009)
N021203	R4	15	0.704	(0.022)	0.113	(0.027)	0.204	(0.008)
N021204	R4	16	0.726	(0.022)	-0.262	(0.021)	0.190	(0.009)
*N010102	R5	12	1.124	(0.193)	-0.050	(0.111)	0.267	(0.037)
*N010103	R5	13	1.795	(0.200)	-1.075	(0.207)	0.209	(0.042)
N021401	R5	14	0.958	(0.043)	-0.798	(0.039)	0.137	(0.011)
N021402	R5	15	1.764	(0.077)	-0.878	(0.050)	0.141	(0.010)
N021403	R5	16	1.650	(0.041)	-1.625	(0.059)	0.221	(0.016)
N021404	R5	17	2.362	(0.225)	-0.410	(0.065)	0.181	(0.008)
*N014301	R5	18	1.755	(0.191)	-0.820	(0.158)	0.190	(0.035)
*N014302	R5	19	1.074	(0.136)	-0.498	(0.108)	0.181	(0.041)
*N014303	R5	20	1.721	(0.187)	-1.041	(0.188)	0.208	(0.041)
*N013001	R5	21	1.020	(0.122)	-0.343	(0.083)	0.165	(0.036)
*N013002	R5	22	0.972	(0.121)	-0.383	(0.090)	0.187	(0.040)
*N013003	R5	23	1.717	(0.164)	-1.123	(0.172)	0.234	(0.041)
*N013004	R5	24	0.994	(0.115)	-0.946	(0.138)	0.216	(0.056)
N021501	R6	5	0.991	(0.036)	-1.340	(0.049)	0.196	(0.014)
N021502	R6	6	1.524	(0.038)	-1.785	(0.060)	0.229	(0.018)
N021503	R6	7	1.100	(0.028)	-2.234	(0.063)	0.214	(0.023)
N021504	R6	8	1.040	(0.039)	-1.280	(0.050)	0.197	(0.014)
N021505	R6	9	1.572	(0.057)	-1.117	(0.052)	0.166	(0.012)
*N010601	R6	10	1.604	(0.196)	-0.634	(0.136)	0.246	(0.036)
*N010602	R6	11	1.788	(0.344)	0.209	(0.153)	0.306	(0.023)
*N010603	R6	12	1.359	(0.199)	-0.258	(0.105)	0.234	(0.033)
*N010604	R6	13	1.637	(0.250)	-0.101	(0.106)	0.235	(0.026)
*N010605	R6	14	1.220	(0.190)	-0.069	(0.098)	0.184	(0.031)
*N013401	R6	15	1.203	(0.177)	-0.250	(0.107)	0.157	(0.035)
*N013402	R6	16	1.438	(0.189)	-0.862	(0.175)	0.205	(0.048)
*N013403	R6	17	1.494	(0.223)	-0.278	(0.116)	0.199	(0.033)

*Used in 1984 reading scale.

Table E.2
1986 IRT Parameters, Reading, Grade 7/Age 13

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
*N002801	R1	20	1.921	(0.114)	-0.767	(0.081)	0.175	(0.028)
*N002802	R1	21	1.896	(0.110)	-0.912	(0.092)	0.143	(0.028)
*N002001	R1	22	1.197	(0.065)	-0.013	(0.050)	0.131	(0.020)
*N002002	R1	23	1.444	(0.084)	-0.042	(0.055)	0.203	(0.020)
*N002003	R1	24	1.583	(0.093)	-0.229	(0.054)	0.224	(0.022)
*N001501	R1	25	1.808	(0.130)	-1.313	(0.152)	0.225	(0.047)
*N001502	R1	26	1.643	(0.098)	-0.507	(0.061)	0.182	(0.026)
*N001503	R1	27	1.345	(0.088)	-0.902	(0.086)	0.207	(0.043)
*N001504	R1	28	1.448	(0.089)	-0.650	(0.068)	0.173	(0.032)
*N003101	R1	29	1.571	(0.100)	-0.645	(0.073)	0.267	(0.032)
*N003102	R1	30	1.530	(0.083)	-0.359	(0.051)	0.145	(0.023)
*N003104	R1	31	0.704	(0.042)	1.923	(0.124)	0.0	(0.0)
*N008201	R2	10	2.724	(0.302)	-0.471	(0.131)	0.323	(0.052)
*N008202	R2	11	1.146	(0.102)	-0.065	(0.102)	0.188	(0.052)
*N008203	R2	12	1.543	(0.141)	-0.289	(0.104)	0.247	(0.054)
*N008204	R2	13	2.600	(0.236)	-0.228	(0.092)	0.209	(0.038)
*N008205	R2	14	2.145	(0.188)	-0.256	(0.092)	0.205	(0.042)
*N005001	R2	15	1.993	(0.102)	1.380	(0.159)	0.211	(0.011)
*N005002	R2	16	0.859	(0.108)	1.288	(0.240)	0.264	(0.029)
*N005003	R2	17	0.737	(0.105)	1.905	(0.331)	0.135	(0.024)
*N003001	R2	18	1.293	(0.109)	1.153	(0.169)	0.207	(0.013)
*N003003	R2	19	2.294	(0.109)	1.724	(0.190)	0.120	(0.006)
*N004601	R3	16	0.899	(0.078)	0.179	(0.104)	0.184	(0.048)
*N004602	R3	17	1.318	(0.103)	-0.085	(0.092)	0.249	(0.044)
*N004603	R3	18	1.485	(0.113)	-0.516	(0.089)	0.226	(0.054)
*N007401	R4	8	1.098	(0.076)	0.531	(0.096)	0.123	(0.027)
*N007402	R4	9	1.304	(0.084)	-0.317	(0.075)	0.176	(0.045)
*N007403	R4	10	1.756	(0.119)	0.214	(0.093)	0.233	(0.027)
*N007404	R4	11	0.985	(0.072)	0.060	(0.088)	0.181	(0.044)
*N007405	R4	12	0.887	(0.102)	1.401	(0.229)	0.187	(0.025)
*N007301	R4	13	1.183	(0.091)	-0.394	(0.100)	0.278	(0.059)
*N007302	R4	14	0.818	(0.059)	0.285	(0.084)	0.136	(0.039)
*N007303	R4	15	1.110	(0.077)	-0.024	(0.084)	0.196	(0.043)
*N007304	R4	16	0.887	(0.072)	-0.007	(0.100)	0.223	(0.053)
*N007305	R4	17	0.529	(0.042)	0.010	(0.077)	0.133	(0.050)
*N007306	R4	18	1.009	(0.057)	-0.116	(0.059)	0.103	(0.035)
*N013401	R4	19	1.203	(0.177)	-0.250	(0.107)	0.157	(0.035)
*N013402	R4	20	1.438	(0.189)	-0.862	(0.175)	0.205	(0.048)
*N013403	R4	21	1.494	(0.223)	-0.278	(0.116)	0.199	(0.033)
N021601	R5	7	0.619	(0.022)	-0.263	(0.024)	0.252	(0.012)
N021602	R5	8	0.785	(0.018)	0.846	(0.039)	0.154	(0.008)
N021603	R5	9	0.368	(0.018)	1.238	(0.085)	0.216	(0.009)
N021604	R5	10	1.381	(0.027)	0.267	(0.030)	0.159	(0.009)
N021605	R5	11	0.794	(0.025)	1.079	(0.059)	0.389	(0.008)
*N003201	R5	12	1.207	(0.088)	-0.593	(0.087)	0.171	(0.056)
*N003202	R5	13	1.590	(0.124)	0.012	(0.093)	0.227	(0.038)
*N003203	R5	14	1.215	(0.101)	0.240	(0.107)	0.222	(0.039)
*N003204	R5	15	1.457	(0.120)	0.260	(0.112)	0.238	(0.035)
N021701	R5	16	1.120	(0.035)	-0.463	(0.028)	0.229	(0.014)
N021702	R5	17	0.915	(0.018)	1.016	(0.039)	0.108	(0.007)
N021703	R5	18	1.351	(0.026)	1.174	(0.053)	0.289	(0.007)
N021201	R6	5	0.861	(0.024)	-0.120	(0.023)	0.180	(0.008)
N021202	R6	6	0.628	(0.021)	-0.153	(0.022)	0.195	(0.009)
N021203	R6	7	0.704	(0.022)	0.113	(0.027)	0.204	(0.008)
N021204	R6	8	0.726	(0.022)	-0.262	(0.021)	0.190	(0.009)
N021301	R6	9	1.081	(0.024)	-0.168	(0.019)	0.0	(0.0)
N021303	R6	11	0.994	(0.031)	-0.745	(0.024)	0.190	(0.010)
N021304	R6	12	0.446	(0.017)	0.397	(0.037)	0.172	(0.008)
N021305	R6	13	0.978	(0.024)	0.214	(0.028)	0.189	(0.007)
N021801	R6	14	1.230	(0.027)	-0.008	(0.024)	0.0	(0.0)
N021803	R6	16	1.184	(0.031)	0.294	(0.038)	0.291	(0.010)
N021805	R6	18	0.965	(0.027)	-0.276	(0.024)	0.0	(0.0)

*Used in 1984 reading scale.

Table E.3
1986 IRT Parameters, Reading, Grade 11/Age 17

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
*N002801	R1	20	1.921	(0.114)	-0.767	(0.081)	0.175	(0.028)
*N002802	R1	21	1.896	(0.110)	-0.912	(0.092)	0.143	(0.028)
*N002001	R1	22	1.197	(0.065)	-0.013	(0.050)	0.131	(0.020)
*N002002	R1	23	1.444	(0.084)	-0.042	(0.055)	0.203	(0.020)
*N002003	R1	24	1.583	(0.093)	-0.229	(0.054)	0.224	(0.022)
*N001501	R1	25	1.808	(0.130)	-1.313	(0.152)	0.225	(0.047)
*N001502	R1	26	1.643	(0.098)	-0.507	(0.061)	0.182	(0.026)
*N001503	R1	27	1.345	(0.088)	-0.902	(0.086)	0.207	(0.043)
*N001504	R1	28	1.448	(0.089)	-0.650	(0.068)	0.173	(0.032)
*N003101	R1	29	1.571	(0.100)	-0.645	(0.073)	0.267	(0.032)
*N003102	R1	30	1.530	(0.083)	-0.359	(0.051)	0.145	(0.023)
*N003104	R1	31	0.704	(0.042)	1.923	(0.124)	0.0	(0.0)
*N008201	R2	10	2.724	(0.302)	-0.471	(0.131)	0.323	(0.052)
*N008202	R2	11	1.146	(0.102)	-0.065	(0.102)	0.188	(0.052)
*N008203	R2	12	1.543	(0.141)	-0.289	(0.104)	0.247	(0.054)
*N008204	R2	13	2.600	(0.236)	-0.228	(0.092)	0.209	(0.038)
*N008205	R2	14	2.145	(0.188)	-0.256	(0.092)	0.205	(0.042)
*N005001	R2	15	1.993	(0.102)	1.380	(0.159)	0.211	(0.011)
*N005002	R2	16	0.859	(0.108)	1.288	(0.240)	0.264	(0.029)
*N005003	R2	17	0.737	(0.105)	1.905	(0.331)	0.135	(0.024)
*N003001	R2	18	1.293	(0.109)	1.153	(0.169)	0.207	(0.013)
*N003003	R2	19	2.294	(0.109)	1.724	(0.190)	0.120	(0.006)
*N004601	R3	16	0.899	(0.078)	0.179	(0.104)	0.184	(0.048)
*N004602	R3	17	1.318	(0.103)	-0.085	(0.092)	0.249	(0.044)
*N004603	R3	18	1.485	(0.113)	-0.516	(0.089)	0.226	(0.054)
*N007401	R4	8	1.098	(0.076)	0.531	(0.096)	0.123	(0.027)
*N007402	R4	9	1.304	(0.084)	-0.317	(0.075)	0.176	(0.045)
*N007403	R4	10	1.756	(0.119)	0.214	(0.093)	0.233	(0.027)
*N007404	R4	11	0.985	(0.072)	0.060	(0.088)	0.181	(0.044)
*N007405	R4	12	0.887	(0.102)	1.401	(0.229)	0.187	(0.025)
*N007301	R4	13	1.183	(0.091)	-0.394	(0.100)	0.278	(0.059)
*N007302	R4	14	0.818	(0.059)	0.285	(0.084)	0.136	(0.039)
*N007303	R4	15	1.110	(0.077)	-0.024	(0.084)	0.196	(0.043)
*N007304	R4	16	0.887	(0.072)	-0.007	(0.100)	0.223	(0.053)
*N007305	R4	17	0.529	(0.042)	0.010	(0.077)	0.133	(0.050)
*N007306	R4	18	1.009	(0.057)	-0.116	(0.059)	0.103	(0.035)
*N013401	R4	19	1.203	(0.177)	-0.250	(0.107)	0.157	(0.035)
*N013402	R4	20	1.438	(0.189)	-0.862	(0.175)	0.205	(0.048)
*N013403	R4	21	1.494	(0.223)	-0.278	(0.116)	0.199	(0.033)
N021601	R5	7	0.619	(0.022)	-0.263	(0.024)	0.252	(0.012)
N021602	R5	8	0.785	(0.018)	0.846	(0.039)	0.154	(0.008)
N021603	R5	9	0.368	(0.018)	1.238	(0.085)	0.216	(0.009)
N021604	R5	10	1.381	(0.027)	0.267	(0.030)	0.159	(0.009)
N021605	R5	11	0.794	(0.025)	1.079	(0.059)	0.389	(0.008)
*N003201	R5	12	1.207	(0.088)	-0.593	(0.087)	0.171	(0.056)
*N003202	R5	13	1.590	(0.124)	0.012	(0.093)	0.227	(0.038)
*N003203	R5	14	1.215	(0.101)	0.240	(0.107)	0.222	(0.039)
*N003204	R5	15	1.457	(0.120)	0.260	(0.112)	0.238	(0.035)
N021701	R5	16	1.120	(0.035)	-0.463	(0.028)	0.229	(0.014)
N021702	R5	17	0.915	(0.018)	1.016	(0.039)	0.108	(0.007)
N021703	R5	18	1.351	(0.026)	1.174	(0.053)	0.289	(0.007)
N021201	R6	5	0.861	(0.024)	-0.120	(0.023)	0.180	(0.008)
N021202	R6	6	0.628	(0.021)	-0.153	(0.022)	0.195	(0.009)
N021203	R6	7	0.704	(0.022)	0.113	(0.027)	0.204	(0.008)
N021204	R6	8	0.726	(0.022)	-0.262	(0.021)	0.190	(0.009)
N021301	R6	9	1.081	(0.024)	-0.168	(0.019)	0.0	(0.0)
N021303	R6	11	0.994	(0.031)	-0.745	(0.024)	0.190	(0.010)
N021304	R6	12	0.446	(0.017)	0.397	(0.037)	0.172	(0.008)
N021305	R6	13	0.978	(0.024)	0.214	(0.028)	0.189	(0.007)
N021801	R6	14	1.230	(0.027)	-0.008	(0.024)	0.0	(0.0)
N021803	R6	16	1.184	(0.031)	0.294	(0.038)	0.291	(0.010)
N021805	R6	18	0.965	(0.027)	-0.276	(0.024)	0.0	(0.0)

*Used in 1984 reading scale.

Table E.4
1986 IRT Parameters, Mathematics, Grade 3/Age 9
Measurement Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N267601	M1	3	2.096	(0.054)	-0.894	(0.052)	0.257	(0.017)
N267602	M1	18	2.246	(0.086)	-0.592	(0.058)	0.227	(0.015)
N265401	M1	21	1.202	(0.438)	1.070	(0.447)	0.282	(0.012)
N266101	M1	22	1.275	(0.035)	0.576	(0.031)	0.294	(0.008)
N269101	M1	23	1.930	(0.095)	0.329	(0.040)	0.220	(0.008)
N268201	M1	24	1.607	(0.069)	-0.256	(0.026)	0.120	(0.011)
N252101	M1	25	0.832	(0.052)	0.880	(0.064)	0.197	(0.009)
N252601	M1	26	2.112	(0.031)	1.445	(0.049)	0.210	(0.006)
N276601	M2	2	1.947	(0.044)	-1.025	(0.047)	0.211	(0.019)
N251401	M2	16	1.472	(0.044)	-0.783	(0.041)	0.150	(0.016)
N252001	M2	25	1.590	(0.075)	0.993	(0.075)	0.228	(0.008)
N267001	M3	16	1.283	(0.041)	-1.194	(0.055)	0.230	(0.024)
N251601	M4	13	1.105	(0.028)	-1.154	(0.040)	0.266	(0.016)
N265201	M4	14	1.463	(0.068)	-0.430	(0.041)	0.456	(0.010)
N252901	M4	23	1.815	(0.071)	0.436	(0.036)	0.114	(0.005)
N237701	M5	23	1.563	(0.172)	0.055	(0.067)	0.262	(0.011)
N219101	M6	11	1.870	(0.043)	-0.599	(0.026)	0.160	(0.010)
N204901	M6	12	0.924	(0.024)	-0.645	(0.023)	0.139	(0.010)
N204601	M6	13	1.087	(0.027)	-0.828	(0.028)	0.212	(0.012)
N216501	M6	17	0.483	(0.030)	1.078	(0.071)	0.248	(0.007)
N236401	M6	19	1.164	(0.337)	1.007	(0.325)	0.285	(0.008)
N216601	M6	22	1.428	(0.049)	-0.104	(0.021)	0.151	(0.008)
N231701	M6	25	2.383	(0.097)	0.239	(0.036)	0.289	(0.007)
N215301	M6	26	2.788	(0.064)	0.592	(0.038)	0.087	(0.005)
N236501	M7	11	1.114	(0.032)	-1.688	(0.060)	0.223	(0.028)
N215401	M7	14	1.425	(0.048)	-0.686	(0.043)	0.213	(0.015)

Table E.5
1986 IRT Parameters, Mathematics, Grade 3/Age 9
Numbers and Operations--High Level Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N277401	M1	2	0.736	(0.024)	-2.216	(0.077)	0.157	(0.025)
N276101	M1	12	1.607	(0.033)	-0.814	(0.033)	0.0	(0.0)
N272301	M2	1	1.566	(0.026)	-1.674	(0.044)	0.154	(0.024)
N275401	M2	7	1.414	(0.025)	-0.916	(0.028)	0.0	(0.0)
N259101	M4	16	1.409	(0.055)	-0.493	(0.040)	0.276	(0.011)
N276501	M4	18	2.058	(0.043)	-0.728	(0.037)	0.171	(0.010)
N238001	M5	15	1.106	(0.042)	-0.609	(0.039)	0.232	(0.013)
N238701	M5	18	1.645	(0.061)	-0.541	(0.044)	0.231	(0.012)
N235501	M5	19	1.425	(0.048)	-0.623	(0.041)	0.206	(0.013)
N239901	M5	20	0.835	(0.081)	0.550	(0.069)	0.188	(0.009)
N235201	M5	22	1.796	(0.124)	-0.058	(0.045)	0.143	(0.009)
N238201	M5	26	2.129	(0.132)	-0.223	(0.053)	0.170	(0.010)
N240001	M5	27	2.336	(0.209)	-0.055	(0.058)	0.139	(0.009)
N230501	M6	9	1.709	(0.070)	-0.092	(0.023)	0.280	(0.007)
N230101	M6	14	0.811	(0.024)	-0.728	(0.027)	0.220	(0.011)
N217201	M6	16	1.521	(0.057)	-0.158	(0.021)	0.244	(0.008)
N207401	M6	18	1.433	(0.059)	-0.101	(0.022)	0.290	(0.008)
N239101	M7	12	1.066	(0.026)	-1.599	(0.050)	0.198	(0.023)
N206601	M7	16	0.704	(0.015)	0.012	(0.011)	0.075	(0.007)
N207801	M7	17	1.735	(0.021)	0.779	(0.021)	0.213	(0.004)
N237601	M7	18	1.399	(0.103)	-0.097	(0.048)	0.280	(0.010)
N234101	M7	21	0.931	(0.022)	0.211	(0.016)	0.152	(0.007)
N239601	M7	28	1.959	(0.292)	1.450	(0.364)	0.117	(0.006)

Table E.6
1986 IRT Parameters, Mathematics, Grade 3/Age 9
Numbers and Operations--Knowledge and Skills Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N276801	M1	4	0.503	(0.019)	-3.780	(0.143)	0.0	(0.0)
N276802	M1	5	0.769	(0.017)	-2.066	(0.049)	0.0	(0.0)
N276803	M1	6	0.841	(0.018)	-0.642	(0.019)	0.0	(0.0)
N257201	M1	11	1.090	(0.045)	-0.724	(0.044)	0.2[illegible]	(0.015)
N286101	M1	13	0.855	(0.023)	-0.860	(0.032)	0.0	(0.0)
N272102	M1	15	1.150	(0.065)	-0.295	(0.040)	0.208	(0.013)
N284001	M1	16	1.162	(0.022)	-0.848	(0.024)	0.0	(0.0)
N284002	M1	17	1.738	(0.028)	0.125	(0.018)	0.0	(0.0)
N257801	M2	3	0.894	(0.032)	-0.960	(0.044)	0.280	(0.014)
N273501	M2	6	0.898	(0.047)	-0.716	(0.050)	0.352	(0.015)
N277501	M2	8	0.886	(0.020)	-0.900	(0.028)	0.0	(0.0)
N277601	M2	9	1.288	(0.021)	-1.101	(0.025)	0.0	(0.0)
N277602	M2	10	1.300	(0.025)	-0.445	(0.017)	0.0	(0.0)
N277603	M2	11	1.234	(0.023)	-0.554	(0.018)	0.0	(0.0)
N261401	M2	12	0.620	(0.037)	-0.256	(0.032)	0.225	(0.013)
N276001	M2	21	0.942	(0.022)	-1.273	(0.039)	0.0	(0.0)
N276002	M2	22	1.202	(0.059)	0.299	(0.034)	0.0	(0.0)
N286102	M2	23	0.865	(0.023)	-0.047	(0.014)	0.0	(0.0)
N272801	M3	15	1.058	(0.038)	-1.152	(0.053)	0.198	(0.020)
N272101	M3	17	1.101	(0.053)	-0.817	(0.055)	0.257	(0.018)
N277901	M4	8	0.899	(0.014)	-1.871	(0.034)	0.0	(0.0)
N277902	M4	9	0.893	(0.014)	-1.839	(0.033)	0.0	(0.0)
N277903	M4	10	1.017	(0.016)	-1.042	(0.021)	0.0	(0.0)
N272302	M4	11	1.185	(0.027)	-1.074	(0.034)	0.232	(0.012)
N272601	M4	17	1.096	(0.025)	-0.376	(0.020)	0.0	(0.0)
N282901	M4	20	0.998	(0.024)	-0.484	(0.021)	0.0	(0.0)
N257701	M4	22	1.766	(0.296)	1.115	(0.248)	0.197	(0.006)
N235601	M6	21	1.149	(0.034)	0.365	(0.021)	0.164	(0.006)
N202801	M7	15	0.955	(0.044)	-0.544	(0.040)	0.247	(0.013)
N239501	M7	23	0.974	(0.051)	-0.454	(0.042)	0.243	(0.013)

Table E.7
1986 IRT Parameters, Mathematics, Grade 7/Age 13
Measurement Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N267201	M1	23	1.063	(0.080)	-0.289	(0.039)	0.261	(0.020)
N265202	M1	30	1.260	(0.076)	0.235	(0.039)	0.247	(0.016)
N266801	M1	31	0.800	(0.030)	-0.188	(0.023)	0.205	(0.016)
N252901	M1	32	1.815	(0.071)	0.436	(0.036)	0.114	(0.005)
N265201	M1	36	1.463	(0.068)	-0.430	(0.041)	0.456	(0.010)
N265901	M1	40	1.643	(0.033)	1.088	(0.042)	0.297	(0.008)
N252101	M1	41	0.832	(0.052)	0.880	(0.064)	0.197	(0.009)
N269001	M1	44	1.468	(0.033)	0.521	(0.026)	0.115	(0.010)
N269101	M2	26	1.930	(0.095)	0.329	(0.040)	0.220	(0.008)
N261801	M2	35	0.915	(0.034)	-0.245	(0.024)	0.195	(0.017)
N252001	M2	40	1.590	(0.075)	0.993	(0.075)	0.228	(0.008)
N269201	M2	44	1.693	(0.023)	1.186	(0.029)	0.0	(0.0)
N266101	M3	27	1.275	(0.035)	0.576	(0.031)	0.294	(0.008)
N265902	M3	31	2.227	(0.041)	1.416	(0.064)	0.399	(0.007)
N285201	M4	29	1.291	(0.032)	0.205	(0.018)	0.0	(0.0)
N266701	M4	32	0.820	(0.023)	1.421	(0.047)	0.210	(0.009)
N251201	M5	26	0.781	(0.021)	0.993	(0.035)	0.162	(0.010)
N284401	M5	27	1.028	(0.023)	0.030	(0.015)	0.0	(0.0)
N252201	M5	30	1.331	(0.023)	0.802	(0.024)	0.0	(0.0)
N265903	M5	31	0.886	(0.025)	1.050	(0.039)	0.257	(0.009)
N251801	M5	32	1.114	(0.022)	0.819	(0.024)	0.0	(0.0)
N266001	M5	38	1.475	(0.020)	1.713	(0.036)	0.0	(0.0)
N252601	M5	40	2.112	(0.031)	1.445	(0.049)	0.210	(0.006)
N267901	M5	41	1.078	(0.020)	2.105	(0.049)	0.0	(0.0)
N219101	M6	15	1.870	(0.043)	-0.599	(0.026)	0.160	(0.010)
N204901	M6	16	0.924	(0.024)	-0.645	(0.023)	0.139	(0.010)
N204601	M6	17	1.087	(0.027)	-0.828	(0.028)	0.212	(0.012)
N216501	M6	21	0.483	(0.030)	1.078	(0.071)	0.248	(0.007)
N216601	M6	26	1.428	(0.049)	-0.104	(0.021)	0.151	(0.008)
N231701	M6	29	2.383	(0.097)	0.239	(0.036)	0.289	(0.007)
N215301	M6	32	2.788	(0.064)	0.592	(0.038)	0.087	(0.005)
N251901	M7	26	1.449	(0.065)	0.221	(0.025)	0.149	(0.010)
N264501	M7	29	1.013	(0.046)	0.115	(0.017)	0.0	(0.0)
N232901	M7	33	1.795	(0.026)	0.760	(0.024)	0.150	(0.006)
N268201	M8	16	1.607	(0.069)	-0.256	(0.026)	0.120	(0.011)
N215701	M8	24	1.400	(0.029)	0.566	(0.024)	0.220	(0.008)
N231501	M8	30	0.699	(0.020)	0.355	(0.019)	0.233	(0.010)
N215601	M8	36	1.628	(0.028)	0.896	(0.031)	0.270	(0.007)
N231801	M8	38	1.296	(0.031)	1.085	(0.042)	0.411	(0.007)
N218501	M8	47	1.811	(0.028)	1.110	(0.037)	0.344	(0.007)
N217101	M8	51	2.307	(0.026)	1.442	(0.041)	0.175	(0.005)
N252701	M8	55	1.437	(0.021)	1.361	(0.032)	0.0	(0.0)
N264301	M8	58	1.488	(0.022)	1.506	(0.035)	0.0	(0.0)
N216401	M9	49	2.011	(0.030)	0.778	(0.029)	0.156	(0.008)
N216301	M9	51	1.538	(0.023)	1.405	(0.039)	0.284	(0.006)

Table E.8
1986 IRT Parameters, Mathematics, Grade 7/Age 13
Numbers and Operations--High Level Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N286201	M1	24	0.984	(0.034)	-0.095	(0.022)	0.203	(0.015)
N258801	M1	38	2.104	(0.032)	1.170	(0.042)	0.326	(0.007)
N275001	M1	42	1.218	(0.049)	0.817	(0.042)	0.0	(0.0)
N286301	M1	45	2.002	(0.032)	0.758	(0.031)	0.197	(0.009)
N277401	M2	8	0.736	(0.024)	-2.216	(0.077)	0.157	(0.025)
N282201	M2	28	1.534	(0.026)	1.044	(0.034)	0.264	(0.008)
N258802	M2	31	2.279	(0.034)	0.808	(0.033)	0.215	(0.008)
N261501	M2	34	1.081	(0.038)	-0.506	(0.028)	0.130	(0.019)
N261601	M2	36	0.808	(0.020)	1.393	(0.041)	0.222	(0.008)
N261301	M2	37	0.940	(0.022)	0.272	(0.019)	0.109	(0.012)
N261201	M2	38	0.935	(0.024)	0.214	(0.020)	0.150	(0.013)
N281401	M2	39	1.110	(0.020)	0.890	(0.025)	0.107	(0.009)
N256501	M3	30	2.150	(0.038)	0.890	(0.041)	0.318	(0.009)
N263901	M4	30	1.584	(0.026)	0.726	(0.026)	0.153	(0.008)
N255302	M4	37	1.809	(0.026)	1.443	(0.042)	0.211	(0.007)
N258201	M4	39	1.065	(0.021)	0.618	(0.022)	0.0	(0.0)
N260902	M4	40	2.739	(0.041)	1.288	(0.057)	0.289	(0.009)
N285401	M4	41	1.378	(0.021)	1.808	(0.039)	0.0	(0.0)
N257901	M5	23	2.217	(0.054)	0.512	(0.040)	0.340	(0.012)
N279301	M5	34	1.357	(0.012)	1.573	(0.021)	0.0	(0.0)
N259501	M5	36	1.292	(0.019)	0.972	(0.024)	0.0	(0.0)
N230501	M6	13	1.709	(0.070)	-0.092	(0.023)	0.280	(0.007)
N230101	M6	18	0.811	(0.024)	-0.728	(0.027)	0.220	(0.011)
N217201	M6	20	1.521	(0.057)	-0.158	(0.021)	0.244	(0.008)
N207401	M6	22	1.433	(0.059)	-0.101	(0.022)	0.290	(0.008)
N207601	M6	33	1.660	(0.050)	1.116	(0.054)	0.176	(0.007)
N208401	M6	34	1.589	(0.068)	0.318	(0.033)	0.236	(0.011)
N201101	M6	42	1.464	(0.021)	0.701	(0.022)	0.158	(0.008)
N204101	M7	18	1.850	(0.046)	-0.012	(0.019)	0.174	(0.010)
N205201	M7	22	1.453	(0.023)	0.531	(0.019)	0.188	(0.007)
N207801	M7	24	1.735	(0.021)	0.779	(0.021)	0.213	(0.004)
N206601	M7	28	0.704	(0.015)	0.012	(0.011)	0.075	(0.007)
N259901	M7	34	1.742	(0.026)	0.801	(0.027)	0.199	(0.007)
N202501	M7	38	1.296	(0.018)	1.036	(0.024)	0.197	(0.006)
N201401	M7	39	1.010	(0.015)	0.985	(0.021)	0.071	(0.006)
N201402	M7	40	0.993	(0.016)	0.601	(0.017)	0.079	(0.008)
N205901	M7	42	1.529	(0.020)	1.326	(0.032)	0.267	(0.006)
N200901	M7	44	1.829	(0.021)	1.071	(0.027)	0.192	(0.006)
N206801	M8	19	2.143	(0.031)	0.596	(0.025)	0.192	(0.007)
N234201	M8	20	1.792	(0.022)	0.797	(0.022)	0.175	(0.006)
N206501	M8	27	1.071	(0.023)	0.246	(0.017)	0.193	(0.010)
N205101	M8	31	2.690	(0.033)	0.922	(0.035)	0.376	(0.006)
N203801	M8	37	0.879	(0.022)	1.684	(0.051)	0.339	(0.006)
N206701	M8	46	1.363	(0.020)	1.043	(0.027)	0.225	(0.007)
N260901	M8	54	3.161	(0.037)	1.170	(0.046)	0.182	(0.007)
N207101	M9	36	1.822	(0.025)	1.042	(0.031)	0.348	(0.006)
N234101	M9	37	0.931	(0.022)	0.211	(0.016)	0.152	(0.007)
N208101	M9	41	1.390	(0.025)	0.424	(0.020)	0.163	(0.009)
N271301	M9	44	2.147	(0.031)	1.249	(0.044)	0.303	(0.007)
N201701	M9	45	1.432	(0.023)	0.897	(0.028)	0.306	(0.007)

Table E.9
1986 IRT Parameters, Mathematics, Grade 7/Age 13
Numbers and Operations--Knowledge and Skills Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N281901	M1	15	1.335	(0.093)	-0.781	(0.068)	0.263	(0.029)
N276801	M1	17	0.503	(0.019)	-3.780	(0.143)	0.0	(0.0)
N276802	M1	18	0.769	(0.017)	-2.066	(0.049)	0.0	(0.0)
N276803	M1	19	0.841	(0.018)	-0.642	(0.019)	0.0	(0.0)
N277601	M1	20	1.288	(0.021)	-1.101	(0.025)	0.0	(0.0)
N277602	M1	21	1.300	(0.025)	-0.445	(0.017)	0.0	(0.0)
N277603	M1	22	1.234	(0.023)	-0.554	(0.018)	0.0	(0.0)
N274801	M1	29	1.291	(0.031)	0.478	(0.027)	0.419	(0.010)
N257601	M1	35	1.552	(0.060)	-0.120	(0.026)	0.0	(0.0)
N260101	M1	43	2.438	(0.035)	0.430	(0.028)	0.237	(0.009)
N261001	M1	47	1.326	(0.026)	0.555	(0.024)	0.236	(0.011)
N283101	M1	51	2.071	(0.025)	1.074	(0.030)	0.183	(0.007)
N277901	M2	9	0.899	(0.014)	-1.871	(0.034)	0.0	(0.0)
N277902	M2	10	0.893	(0.014)	-1.839	(0.033)	0.0	(0.0)
N277903	M2	11	1.017	(0.016)	-1.042	(0.021)	0.0	(0.0)
N286601	M2	23	1.538	(0.023)	0.438	(0.017)	0.0	(0.0)
N286602	M2	24	1.311	(0.020)	0.538	(0.017)	0.0	(0.0)
N286603	M2	25	1.935	(0.021)	0.787	(0.019)	0.0	(0.0)
N258803	M2	41	1.747	(0.022)	1.030	(0.026)	0.167	(0.007)
N275301	M3	25	0.768	(0.050)	-0.345	(0.037)	0.222	(0.022)
N282202	M3	26	1.083	(0.024)	0.333	(0.020)	0.310	(0.011)
N256301	M4	19	1.126	(0.019)	0.237	(0.014)	0.0	(0.0)
N280601	M4	23	1.759	(0.018)	0.674	(0.016)	0.0	(0.0)
N280602	M4	24	1.935	(0.020)	0.664	(0.017)	0.0	(0.0)
N280603	M4	25	1.682	(0.025)	0.244	(0.016)	0.0	(0.0)
N280604	M4	26	1.913	(0.017)	0.912	(0.017)	0.0	(0.0)
N280605	M4	27	2.018	(0.022)	0.537	(0.017)	0.0	(0.0)
N280606	M4	28	1.614	(0.016)	0.973	(0.017)	0.0	(0.0)
N271401	M4	33	1.815	(0.029)	1.218	(0.040)	0.405	(0.008)
N278301	M4	35	1.445	(0.019)	0.603	(0.017)	0.0	(0.0)
N278302	M4	36	1.743	(0.017)	1.106	(0.020)	0.0	(0.0)
N284101	M5	18	0.670	(0.035)	-2.177	(0.119)	0.0	(0.0)
N284102	M5	19	0.596	(0.021)	-0.776	(0.032)	0.0	(0.0)
N284501	M5	20	0.798	(0.015)	0.156	(0.012)	0.0	(0.0)
N284502	M5	21	1.159	(0.026)	-0.361	(0.018)	0.0	(0.0)
N284503	M5	22	1.594	(0.022)	0.301	(0.015)	0.0	(0.0)
N273902	M5	25	1.991	(0.028)	0.622	(0.024)	0.145	(0.009)
N285001	M5	28	1.331	(0.021)	0.528	(0.018)	0.0	(0.0)
N274802	M5	29	2.350	(0.031)	0.637	(0.026)	0.161	(0.009)
N260701	M5	33	1.693	(0.020)	0.869	(0.020)	0.0	(0.0)
N235601	M6	25	1.149	(0.034)	0.365	(0.021)	0.164	(0.006)
N258804	M7	20	1.268	(0.030)	0.200	(0.020)	0.376	(0.009)
N260601	M7	21	1.283	(0.019)	0.442	(0.014)	0.0	(0.0)
N257401	M7	23	1.371	(0.039)	0.353	(0.025)	0.260	(0.010)
N274101	M7	25	2.392	(0.055)	0.861	(0.049)	0.512	(0.007)
N278501	M7	30	3.117	(0.031)	0.429	(0.019)	0.0	(0.0)
N278502	M7	31	2.647	(0.024)	0.525	(0.017)	0.0	(0.0)
N278503	M7	32	2.692	(0.032)	0.337	(0.018)	0.0	(0.0)
N286102	M8	17	0.865	(0.023)	-0.047	(0.014)	0.0	(0.0)
N225901	M8	23	1.676	(0.021)	0.909	(0.023)	0.302	(0.006)
N287301	M8	25	1.195	(0.017)	0.803	(0.018)	0.0	(0.0)
N287302	M8	26	1.572	(0.019)	1.741	(0.030)	0.0	(0.0)
N280401	M8	33	1.004	(0.019)	0.235	(0.014)	0.0	(0.0)
N230201	M8	35	0.914	(0.017)	1.165	(0.027)	0.155	(0.006)
N278905	M8	52	2.237	(0.033)	1.467	(0.050)	0.275	(0.007)
N201001	M8	57	3.849	(0.046)	1.335	(0.061)	0.277	(0.006)

Table E.10
1986 IRT Parameters, Mathematics, Grade 7/Age 13
Geometry Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N254601	M1	16	0.789	(0.043)	-1.857	(0.106)	0.239	(0.031)
N254602	M1	46	1.869	(0.061)	0.621	(0.054)	0.228	(0.009)
N270301	M2	20	0.771	(0.039)	-1.048	(0.059)	0.205	(0.020)
N270302	M2	21	2.133	(0.047)	0.869	(0.050)	0.055	(0.005)
N253701	M2	22	0.543	(0.056)	-0.457	(0.058)	0.258	(0.019)
N254001	M3	28	0.722	(0.045)	-0.465	(0.039)	0.189	(0.017)
N269901	M3	29	0.761	(0.099)	-0.102	(0.045)	0.251	(0.019)
N264601	M4	34	1.305	(0.050)	1.143	(0.072)	0.357	(0.008)
N254501	M5	35	0.842	(0.053)	-0.090	(0.031)	0.241	(0.015)
N253202	M5	37	1.274	(0.049)	0.997	(0.063)	0.188	(0.010)
N253801	M5	42	1.311	(0.061)	2.918	(0.190)	0.080	(0.005)
N254301	M7	35	1.228	(0.039)	0.872	(0.048)	0.256	(0.007)
N213101	M7	36	1.002	(0.129)	1.144	(0.164)	0.257	(0.009)
N214901	M7	41	0.394	(0.021)	1.262	(0.070)	0.165	(0.009)
N226201	M7	47	1.969	(0.051)	1.555	(0.084)	0.348	(0.006)
N214701	M8	22	0.573	(0.027)	0.259	(0.025)	0.279	(0.010)
N234901	M8	32	1.283	(0.042)	0.489	(0.033)	0.176	(0.007)
N251701	M8	40	1.046	(0.046)	0.682	(0.047)	0.170	(0.009)
N213601	M8	41	1.763	(0.048)	0.771	(0.046)	0.156	(0.007)
N212901	M9	32	1.650	(0.052)	-0.661	(0.036)	0.236	(0.014)
N212902	M9	33	1.545	(0.056)	0.103	(0.025)	0.121	(0.008)
N212903	M9	34	1.478	(0.055)	0.323	(0.034)	0.281	(0.007)
N226401	M9	35	0.698	(0.030)	0.274	(0.026)	0.287	(0.009)
N215001	M9	39	0.643	(0.025)	0.036	(0.020)	0.189	(0.010)

Table E.11
1986 IRT Parameters, Mathematics, Grade 11/Age 17
Measurement Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N264301	M1	47	1.488	(0.022)	1.506	(0.035)	0.0	(0.0)
N251101	M1	49	1.574	(0.023)	1.662	(0.042)	0.0	(0.0)
N266801	M2	16	0.800	(0.030)	-0.188	(0.023)	0.205	(0.016)
N269001	M2	22	1.468	(0.033)	0.521	(0.026)	0.115	(0.010)
N261801	M2	25	0.915	(0.034)	-0.245	(0.024)	0.195	(0.017)
N268901	M2	47	2.801	(0.046)	1.413	(0.070)	0.209	(0.012)
N268801	M2	48	2.443	(0.038)	1.834	(0.071)	0.091	(0.008)
N266501	M3	31	1.165	(0.032)	0.670	(0.037)	0.226	(0.016)
N285201	M4	29	1.291	(0.032)	0.205	(0.018)	0.0	(0.0)
N266701	M4	32	0.820	(0.023)	1.421	(0.047)	0.210	(0.009)
N251201	M5	26	0.781	(0.021)	0.993	(0.035)	0.162	(0.010)
N284401	M5	27	1.028	(0.023)	0.030	(0.015)	0.0	(0.0)
N252201	M5	30	1.331	(0.023)	0.802	(0.024)	0.0	(0.0)
N265903	M5	31	0.886	(0.025)	1.050	(0.039)	0.257	(0.009)
N251801	M5	32	1.114	(0.022)	0.819	(0.024)	0.0	(0.0)
N266001	M5	38	1.475	(0.020)	1.713	(0.036)	0.0	(0.0)
N252601	M5	40	2.112	(0.031)	1.445	(0.049)	0.210	(0.006)
N267901	M5	41	1.078	(0.020)	2.105	(0.049)	0.0	(0.0)
N266101	M6	24	1.275	(0.035)	0.576	(0.031)	0.294	(0.008)
N265901	M6	39	1.643	(0.033)	1.088	(0.042)	0.297	(0.008)
N269201	M6	41	1.693	(0.023)	1.186	(0.029)	0.0	(0.0)
N265902	M6	42	2.227	(0.041)	1.416	(0.064)	0.399	(0.007)
N252701	M6	44	1.437	(0.021)	1.361	(0.032)	0.0	(0.0)
N218501	M7	20	1.811	(0.028)	1.110	(0.037)	0.344	(0.007)
N216401	M7	28	2.011	(0.030)	0.778	(0.029)	0.156	(0.008)
N216301	M7	30	1.538	(0.023)	1.405	(0.039)	0.284	(0.006)
N216101	M7	33	1.963	(0.026)	1.069	(0.034)	0.133	(0.009)
N217101	M7	34	2.307	(0.026)	1.442	(0.041)	0.175	(0.005)
N215701	M8	18	1.400	(0.029)	0.566	(0.024)	0.220	(0.008)
N215601	M8	26	1.628	(0.028)	0.896	(0.031)	0.270	(0.007)
N232101	M8	41	1.816	(0.030)	1.923	(0.060)	0.173	(0.007)
N231801	M8	43	1.296	(0.031)	1.085	(0.042)	0.411	(0.007)
N216201	M9	43	1.176	(0.023)	1.307	(0.039)	0.182	(0.010)
N231501	M10	13	0.699	(0.020)	0.355	(0.019)	0.233	(0.010)
N232901	M10	15	1.795	(0.026)	0.760	(0.024)	0.150	(0.006)
N267801	M10	20	1.255	(0.022)	1.233	(0.035)	0.207	(0.009)
N230701	M10	28	2.188	(0.038)	1.912	(0.074)	0.326	(0.007)
N219001	M10	30	1.804	(0.038)	0.694	(0.038)	0.211	(0.013)
N218801	M11	22	1.408	(0.025)	0.966	(0.032)	0.158	(0.010)

Table E.12
1986 IRT Parameters, Mathematics, Grade 11/Age 17
Numbers and Operations--High Level Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N286302	M1	22	1.503	(0.034)	0.726	(0.040)	0.289	(0.017)
N258802	M1	26	2.279	(0.034)	0.808	(0.033)	0.215	(0.008)
N259901	M1	28	1.742	(0.026)	0.801	(0.027)	0.199	(0.007)
N260901	M1	35	3.161	(0.037)	1.170	(0.046)	0.182	(0.007)
N261501	M2	24	1.081	(0.038)	-0.506	(0.028)	0.130	(0.019)
N261201	M2	26	0.935	(0.024)	0.214	(0.020)	0.150	(0.013)
N261601	M2	27	0.808	(0.020)	1.393	(0.041)	0.222	(0.008)
N261301	M2	28	0.940	(0.022)	0.272	(0.019)	0.109	(0.012)
N281401	M2	29	1.110	(0.020)	0.890	(0.025)	0.107	(0.009)
N259001	M2	31	1.608	(0.023)	0.871	(0.027)	0.0	(0.0)
N286301	M2	33	2.002	(0.032)	0.758	(0.031)	0.197	(0.009)
N258801	M2	38	2.104	(0.032)	1.170	(0.042)	0.326	(0.007)
N260801	M2	43	1.731	(0.021)	1.358	(0.032)	0.0	(0.0)
N255301	M2	46	2.054	(0.050)	2.258	(0.113)	0.231	(0.008)
N271301	M3	32	2.147	(0.031)	1.249	(0.044)	0.303	(0.007)
N263901	M4	30	1.584	(0.026)	0.726	(0.026)	0.153	(0.008)
N255302	M4	37	1.809	(0.026)	1.443	(0.042)	0.211	(0.007)
N258201	M4	39	1.065	(0.021)	0.618	(0.022)	0.0	(0.0)
N260902	M4	40	2.739	(0.041)	1.288	(0.057)	0.289	(0.009)
N285401	M4	41	1.378	(0.021)	1.808	(0.039)	0.0	(0.0)
N257901	M5	23	2.217	(0.054)	0.512	(0.040)	0.340	(0.012)
N279301	M5	34	1.357	(0.012)	1.573	(0.021)	0.0	(0.0)
N259501	M5	36	1.292	(0.019)	0.972	(0.024)	0.0	(0.0)
N286201	M6	23	0.984	(0.034)	-0.095	(0.022)	0.203	(0.015)
N282201	M6	27	1.534	(0.026)	1.044	(0.034)	0.264	(0.008)
N256501	M6	35	2.150	(0.038)	0.890	(0.041)	0.318	(0.009)
N234201	M7	21	1.792	(0.022)	0.797	(0.022)	0.175	(0.006)
N201401	M7	23	1.010	(0.015)	0.985	(0.021)	0.071	(0.006)
N201402	M7	24	0.993	(0.016)	0.601	(0.017)	0.079	(0.008)
N201101	M7	25	1.464	(0.021)	0.701	(0.022)	0.158	(0.008)
N202501	M7	27	1.296	(0.018)	1.036	(0.024)	0.197	(0.006)
N204101	M8	16	1.850	(0.046)	-0.012	(0.019)	0.174	(0.010)
N208101	M8	17	1.390	(0.025)	0.424	(0.020)	0.163	(0.009)
N206601	M8	20	0.704	(0.015)	0.012	(0.011)	0.075	(0.007)
N207101	M8	24	1.822	(0.025)	1.042	(0.031)	0.348	(0.006)
N206501	M8	25	1.071	(0.023)	0.246	(0.017)	0.193	(0.010)
N201701	M8	30	1.432	(0.023)	0.897	(0.028)	0.306	(0.007)
N200101	M8	31	1.563	(0.039)	0.155	(0.027)	0.181	(0.018)
N200901	M8	34	1.829	(0.021)	1.071	(0.027)	0.192	(0.006)
N206801	M9	38	2.143	(0.031)	0.596	(0.025)	0.192	(0.007)
N262001	M9	42	2.200	(0.032)	0.872	(0.036)	0.216	(0.012)
N203801	M9	46	0.879	(0.022)	1.684	(0.051)	0.339	(0.006)
N204501	M9	48	1.892	(0.026)	1.034	(0.034)	0.194	(0.011)
N234101	M9	53	0.931	(0.022)	0.211	(0.016)	0.152	(0.007)
N205501	M10	11	0.795	(0.019)	2.048	(0.057)	0.227	(0.007)
N205201	M10	12	1.453	(0.023)	0.531	(0.019)	0.188	(0.007)
N208301	M10	19	2.072	(0.027)	1.874	(0.052)	0.241	(0.006)
N205901	M10	22	1.529	(0.020)	1.326	(0.032)	0.267	(0.006)
N206701	M10	26	1.363	(0.020)	1.043	(0.027)	0.225	(0.007)
N205801	M10	31	2.727	(0.031)	1.668	(0.053)	0.189	(0.007)
N227101	M10	35	1.266	(0.029)	1.759	(0.059)	0.241	(0.009)
N205101	M11	14	2.690	(0.033)	0.922	(0.035)	0.376	(0.006)
N207801	M11	15	1.735	(0.021)	0.779	(0.021)	0.213	(0.004)
N204401	M11	21	2.399	(0.024)	1.063	(0.029)	0.105	(0.007)
N202701	M11	40	2.959	(0.034)	1.771	(0.059)	0.076	(0.005)

Table E.13
1986 IRT Parameters, Mathematics, Grade 11/Age 17
Numbers and Operations--Knowledge and Skills Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N260601	M1	16	1.283	(0.019)	0.442	(0.014)	0.0	(0.0)
N258804	M1	18	1.268	(0.030)	0.200	(0.020)	0.376	(0.009)
N278501	M1	23	3.117	(0.031)	0.429	(0.019)	0.0	(0.0)
N278502	M1	24	2.647	(0.024)	0.525	(0.017)	0.0	(0.0)
N278503	M1	25	2.692	(0.032)	0.337	(0.018)	0.0	(0.0)
N287101	M1	29	2.382	(0.035)	0.805	(0.035)	0.296	(0.011)
N286502	M1	34	2.908	(0.036)	0.834	(0.035)	0.192	(0.011)
N258803	M1	37	1.747	(0.022)	1.030	(0.026)	0.167	(0.007)
N278905	M1	44	2.237	(0.033)	1.467	(0.050)	0.275	(0.007)
N287301	M1	45	1.195	(0.017)	0.803	(0.018)	0.0	(0.0)
N287302	M1	46	1.572	(0.019)	1.741	(0.030)	0.0	(0.0)
N260101	M2	20	2.438	(0.035)	0.630	(0.028)	0.237	(0.009)
N280401	M2	30	1.004	(0.019)	0.235	(0.014)	0.0	(0.0)
N287102	M2	32	2.600	(0.038)	0.658	(0.033)	0.162	(0.013)
N286501	M2	34	2.388	(0.041)	0.530	(0.033)	0.172	(0.016)
N261001	M2	40	1.326	(0.026)	0.555	(0.024)	0.236	(0.011)
N256301	M4	19	1.126	(0.019)	0.237	(0.014)	0.0	(0.0)
N280601	M4	23	1.759	(0.018)	0.674	(0.016)	0.0	(0.0)
N280602	M4	24	1.935	(0.020)	0.664	(0.017)	0.0	(0.0)
N280603	M4	25	1.682	(0.025)	0.244	(0.016)	0.0	(0.0)
N280604	M4	26	1.913	(0.017)	0.912	(0.017)	0.0	(0.0)
N280605	M4	27	2.018	(0.022)	0.537	(0.017)	0.0	(0.0)
N280606	M4	28	1.614	(0.016)	0.973	(0.017)	0.0	(0.0)
N271401	M4	33	1.815	(0.029)	1.218	(0.040)	0.405	(0.008)
N278301	M4	35	1.445	(0.019)	0.603	(0.017)	0.0	(0.0)
N278302	M4	36	1.743	(0.017)	1.106	(0.020)	0.0	(0.0)
N284101	M5	18	0.670	(0.035)	-2.177	(0.119)	0.0	(0.0)
N284102	M5	19	0.596	(0.021)	-0.776	(0.032)	0.0	(0.0)
N284501	M5	20	0.798	(0.015)	0.156	(0.012)	0.0	(0.0)
N284502	M5	21	1.159	(0.026)	-0.361	(0.018)	0.0	(0.0)
N284503	M5	22	1.594	(0.022)	0.301	(0.015)	0.0	(0.0)
N273902	M5	25	1.991	(0.028)	0.622	(0.024)	0.145	(0.009)
N285001	M5	28	1.331	(0.021)	0.528	(0.018)	0.0	(0.0)
N274802	M5	29	2.350	(0.031)	0.637	(0.026)	0.161	(0.009)
N260701	M5	33	1.693	(0.020)	0.869	(0.020)	0.0	(0.0)
N277901	M6	14	0.899	(0.014)	-1.871	(0.034)	0.0	(0.0)
N277902	M6	15	0.893	(0.014)	-1.839	(0.033)	0.0	(0.0)
N277903	M6	16	1.017	(0.016)	-1.042	(0.021)	0.0	(0.0)
N276801	M6	17	0.503	(0.019)	-3.780	(0.143)	0.0	(0.0)
N276802	M6	18	0.769	(0.017)	-2.066	(0.049)	0.0	(0.0)
N276803	M6	19	0.841	(0.018)	-0.642	(0.019)	0.0	(0.0)
N277601	M6	20	1.288	(0.021)	-1.101	(0.025)	0.0	(0.0)
N277602	M6	21	1.300	(0.025)	-0.445	(0.017)	0.0	(0.0)
N277603	M6	22	1.234	(0.023)	-0.554	(0.018)	0.0	(0.0)
N274801	M6	25	1.291	(0.031)	0.478	(0.027)	0.419	(0.010)
N286601	M6	28	1.538	(0.023)	0.438	(0.017)	0.0	(0.0)
N286602	M6	29	1.311	(0.020)	0.538	(0.017)	0.0	(0.0)
N286603	M6	30	1.935	(0.021)	0.787	(0.019)	0.0	(0.0)
N283101	M6	40	2.071	(0.025)	1.074	(0.030)	0.183	(0.007)
N230201	M8	35	0.914	(0.017)	1.165	(0.027)	0.155	(0.006)
N201001	M8	42	3.849	(0.046)	1.335	(0.061)	0.277	(0.006)
N282202	M9	34	1.083	(0.024)	0.333	(0.020)	0.310	(0.011)
N284001	M11	12	1.162	(0.022)	-0.848	(0.024)	0.0	(0.0)
N284002	M11	13	1.738	(0.028)	0.125	(0.018)	0.0	(0.0)
N225901	M11	17	1.676	(0.021)	0.909	(0.023)	0.302	(0.006)
N200201	M11	26	1.749	(0.022)	1.263	(0.030)	0.204	(0.007)

BEST COPY AVAILABLE

Table E.14
1986 IRT Parameters, Mathematics, Grade 11/Age 17
Geometry Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N254602	M1	27	1.869	(0.061)	0.621	(0.054)	0.228	(0.009)
N270301	M1	30	0.771	(0.039)	-1.048	(0.059)	0.205	(0.020)
N270302	M1	31	2.133	(0.047)	0.869	(0.050)	0.055	(0.005)
N254301	M1	33	1.228	(0.039)	0.872	(0.048)	0.256	(0.007)
N253901	M1	39	1.707	(0.058)	0.643	(0.060)	0.216	(0.015)
N253902	M1	40	0.505	(0.032)	1.205	(0.088)	0.347	(0.016)
N253903	M1	41	2.043	(0.051)	1.450	(0.079)	0.318	(0.012)
N253904	M1	42	1.210	(0.038)	1.248	(0.066)	0.299	(0.013)
N254601	M2	15	0.789	(0.043)	-1.857	(0.106)	0.239	(0.031)
N254001	M2	21	0.722	(0.045)	-0.465	(0.039)	0.189	(0.017)
N251701	M2	41	1.046	(0.046)	0.682	(0.047)	0.170	(0.009)
N264601	M4	34	1.305	(0.050)	1.143	(0.072)	0.357	(0.008)
N254501	M5	35	0.842	(0.053)	-0.090	(0.031)	0.241	(0.015)
N253202	M5	37	1.274	(0.049)	0.997	(0.063)	0.188	(0.010)
N253801	M5	42	1.311	(0.061)	2.918	(0.190)	0.080	(0.005)
N219301	M7	19	1.603	(0.034)	1.324	(0.050)	0.077	(0.007)
N212901	M8	21	1.650	(0.052)	-0.661	(0.036)	0.236	(0.014)
N212902	M8	22	1.545	(0.056)	0.103	(0.025)	0.121	(0.008)
N212903	M8	23	1.478	(0.055)	0.323	(0.034)	0.281	(0.007)
N213001	M8	27	1.542	(0.048)	0.719	(0.050)	0.251	(0.010)
N213201	M8	29	0.849	(0.030)	0.735	(0.041)	0.219	(0.011)
N234901	M8	37	1.283	(0.042)	0.489	(0.033)	0.176	(0.007)
N226401	M9	35	0.698	(0.030)	0.274	(0.026)	0.287	(0.009)
N215001	M9	37	0.643	(0.025)	0.036	(0.020)	0.189	(0.010)
N214701	M9	39	0.573	(0.027)	0.259	(0.025)	0.279	(0.010)
N213601	M9	40	1.763	(0.048)	0.771	(0.046)	0.156	(0.007)
N214901	M9	45	0.394	(0.021)	1.262	(0.070)	0.165	(0.009)
N213401	M9	49	1.142	(0.040)	0.909	(0.055)	0.228	(0.012)
N213501	M9	50	0.693	(0.033)	1.154	(0.069)	0.271	(0.014)
N212701	M10	21	0.800	(0.031)	0.872	(0.047)	0.237	(0.012)
N226201	M10	25	1.969	(0.051)	1.555	(0.084)	0.348	(0.006)
N232001	M10	27	1.217	(0.038)	1.806	(0.084)	0.307	(0.009)
N215101	M10	29	1.087	(0.032)	1.881	(0.074)	0.140	(0.008)
N213701	M11	28	1.518	(0.038)	1.397	(0.061)	0.188	(0.008)
N214501	M11	30	0.822	(0.036)	2.899	(0.143)	0.118	(0.006)
N214801	M11	38	1.034	(0.042)	1.780	(0.095)	0.242	(0.010)
N230801	M11	41	1.402	(0.086)	2.736	(0.254)	0.266	(0.009)

Table E.15
1986 IRT Parameters, Mathematics, Grade 11/Age 17
Relations and Functions Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N256101	M1	15	1.101	(0.044)	-1.338	(0.066)	0.0	(0.0)
N255701	M1	32	1.345	(0.107)	-0.371	(0.053)	0.216	(0.021)
N282801	M1	48	1.733	(0.079)	1.464	(0.121)	0.209	(0.011)
N264701	M2	39	1.202	(0.103)	0.100	(0.048)	0.199	(0.018)
N255601	M2	45	1.045	(0.072)	1.502	(0.136)	0.285	(0.013)
N255501	M3	33	0.923	(0.055)	0.933	(0.076)	0.283	(0.013)
N256001	M3	34	0.926	(0.052)	0.298	(0.031)	0.0	(0.0)
N257101	M3	35	0.928	(0.071)	2.184	(0.201)	0.310	(0.011)
N255101	M4	38	1.170	(0.082)	0.546	(0.066)	0.221	(0.015)
N282701	M5	24	0.644	(0.057)	-0.849	(0.082)	0.237	(0.024)
N270701	M6	37	2.282	(0.184)	-0.029	(0.061)	0.113	(0.014)
N270702	M6	38	1.092	(0.057)	0.602	(0.055)	0.176	(0.015)
N255401	M6	43	1.835	(0.089)	1.934	(0.177)	0.234	(0.010)
N285901	M6	46	1.527	(0.069)	1.051	(0.085)	0.179	(0.013)
N209401	M8	32	1.057	(0.060)	-0.024	(0.032)	0.198	(0.014)
N210901	M8	36	1.237	(0.056)	0.663	(0.051)	0.214	(0.009)
N208601	M8	38	0.842	(0.038)	0.879	(0.051)	0.124	(0.009)
N210101	M8	46	1.683	(0.060)	1.429	(0.092)	0.172	(0.008)
N208501	M8	47	1.435	(0.062)	1.038	(0.077)	0.185	(0.009)
N209801	M9	44	0.734	(0.050)	0.335	(0.039)	0.213	(0.013)
N211901	M9	51	0.924	(0.062)	1.141	(0.097)	0.330	(0.011)
N210601	M10	14	1.256	(0.057)	-0.445	(0.037)	0.162	(0.016)
N210701	M10	16	1.302	(0.068)	-0.344	(0.036)	0.176	(0.015)
N209601	M10	17	0.922	(0.038)	1.224	(0.063)	0.156	(0.008)
N209501	M10	18	1.199	(0.059)	0.053	(0.030)	0.156	(0.012)
N233401	M10	23	0.865	(0.047)	-0.219	(0.031)	0.231	(0.015)
N233402	M10	24	0.913	(0.049)	0.095	(0.031)	0.233	(0.013)
N211801	M10	32	1.114	(0.106)	3.159	(0.379)	0.168	(0.007)
N255901	M10	33	0.941	(0.066)	2.350	(0.200)	0.217	(0.009)
N255902	M10	34	1.664	(0.077)	1.461	(0.121)	0.228	(0.010)
N208801	M11	16	0.940	(0.036)	0.131	(0.027)	0.123	(0.011)
N226001	M11	18	1.877	(0.082)	-0.273	(0.037)	0.096	(0.013)
N210401	M11	20	2.057	(0.102)	-0.121	(0.040)	0.121	(0.012)
N209301	M11	23	1.760	(0.065)	0.678	(0.053)	0.237	(0.008)
N209901	M11	24	1.520	(0.057)	0.416	(0.038)	0.114	(0.008)
N210301	M11	25	1.493	(0.060)	0.831	(0.063)	0.344	(0.009)
N208901	M11	34	0.535	(0.038)	1.587	(0.121)	0.282	(0.010)
N229901	M11	37	1.671	(0.055)	1.037	(0.067)	0.120	(0.007)

Table E.16
1986 IRT Parameters, Science, Grade 3/Age 9
Life Sciences Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N400001	S1	6	1.053	(0.059)	-0.250	(0.036)	0.251	(0.011)
N400301	S1	8	0.841	(0.077)	0.164	(0.042)	0.317	(0.011)
N400401	S1	9	1.955	(0.103)	-0.580	(0.065)	0.491	(0.012)
N400402	S1	10	2.503	(0.107)	-0.579	(0.063)	0.419	(0.011)
N400403	S1	11	1.433	(0.072)	-0.696	(0.060)	0.517	(0.013)
N400404	S1	12	1.547	(0.092)	-0.435	(0.053)	0.441	(0.011)
N400405	S1	13	1.669	(0.096)	-0.508	(0.059)	0.471	(0.012)
N400601	S1	17	0.912	(0.061)	-0.037	(0.032)	0.241	(0.011)
N400701	S1	18	1.223	(0.137)	0.345	(0.060)	0.280	(0.009)
N400901	S1	19	0.473	(0.097)	2.237	(0.462)	0.298	(0.008)
N401001	S1	20	0.681	(0.057)	0.480	(0.051)	0.209	(0.009)
N401101	S1	21	0.419	(0.061)	1.524	(0.225)	0.288	(0.010)
N401201	S1	22	1.202	(0.027)	0.808	(0.029)	0.265	(0.006)
N401301	S1	23	0.895	(0.125)	0.926	(0.142)	0.300	(0.008)
N412101	S4	10	0.825	(0.027)	-0.808	(0.032)	0.270	(0.011)
N412201	S4	11	1.630	(0.051)	-0.481	(0.029)	0.225	(0.009)
N415501	S4	16	2.438	(0.076)	1.050	(0.072)	0.197	(0.004)
N412301	S4	21	1.126	(0.064)	0.194	(0.027)	0.285	(0.007)
N413901	S5	5	1.211	(0.029)	-1.169	(0.039)	0.197	(0.016)
N414101	S5	6	0.587	(0.025)	-1.322	(0.060)	0.218	(0.017)
N414901	S5	7	1.274	(0.032)	-0.989	(0.037)	0.203	(0.014)
N414801	S5	8	0.527	(0.025)	-0.814	(0.045)	0.247	(0.013)
N434601	S5	10	1.123	(0.045)	-0.476	(0.033)	0.232	(0.010)
N433001	S5	11	0.611	(0.024)	-1.084	(0.049)	0.224	(0.015)
N415101	S5	14	1.444	(0.046)	-0.681	(0.038)	0.222	(0.012)
N433101	S5	18	0.662	(0.041)	-0.003	(0.027)	0.228	(0.010)
N415801	S6	6	1.283	(0.030)	-1.158	(0.039)	0.209	(0.016)
N416001	S6	7	0.588	(0.032)	-0.091	(0.023)	0.185	(0.010)
N415401	S6	11	0.493	(0.030)	-0.219	(0.027)	0.253	(0.011)
N412501	S6	13	0.996	(0.067)	0.112	(0.031)	0.204	(0.009)
N415701	S6	14	1.014	(0.053)	-0.174	(0.029)	0.193	(0.010)
N433201	S6	17	0.893	(0.109)	0.833	(0.111)	0.212	(0.007)
N415601	S6	18	1.086	(0.123)	0.491	(0.071)	0.236	(0.008)
N437801	S7	10	0.875	(0.129)	0.903	(0.143)	0.301	(0.007)
N437901	S7	11	0.907	(0.054)	-0.005	(0.029)	0.218	(0.009)
N438101	S7	13	0.668	(0.100)	1.210	(0.187)	0.263	(0.007)
N438701	S7	19	0.804	(0.242)	2.280	(0.703)	0.255	(0.006)
N438801	S7	20	0.852	(0.119)	0.932	(0.140)	0.257	(0.007)
N438901	S7	21	1.226	(0.097)	0.150	(0.037)	0.176	(0.008)

Table E.17
1986 IRT Parameters, Science, Grade 3/Age 9
Nature of Science Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N403001	S3	12	0.986	(0.033)	-2.543	(0.097)	0.189	(0.037)
N403101	S3	13	1.039	(0.033)	-2.337	(0.087)	0.186	(0.036)
N403501	S3	18	0.825	(0.141)	1.018	(0.191)	0.454	(0.010)
N403502	S3	19	0.771	(0.049)	-1.147	(0.084)	0.471	(0.019)
N403503	S3	20	0.611	(0.104)	0.898	(0.167)	0.474	(0.012)
N403701	S3	22	4.231	(0.193)	-0.508	(0.104)	0.330	(0.013)
N403702	S3	23	3.314	(0.152)	-0.530	(0.081)	0.374	(0.013)
N403703	S3	24	3.262	(0.172)	-0.461	(0.081)	0.323	(0.013)
N403901	S3	29	0.766	(0.059)	0.109	(0.035)	0.170	(0.013)
N404001	S3	30	0.486	(0.050)	0.748	(0.084)	0.191	(0.012)
N434401	S4	15	0.887	(0.038)	-0.171	(0.020)	0.155	(0.009)
N413201	S4	17	1.771	(0.097)	0.413	(0.045)	0.367	(0.006)
N413401	S4	19	1.690	(0.099)	-0.115	(0.027)	0.178	(0.008)
N413701	S4	23	0.504	(0.020)	0.221	(0.017)	0.162	(0.008)
N433301	S6	5	0.602	(0.030)	-1.302	(0.069)	0.192	(0.019)
N433401	S6	8	0.933	(0.110)	0.325	(0.054)	0.194	(0.010)
N437601	S7	8	1.146	(0.032)	-1.964	(0.069)	0.183	(0.030)

Table E.18
1986 IRT Parameters, Science, Grade 3/Age 9
Physical Sciences Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N400501	S1	14	0.516	(0.101)	2.456	(0.493)	0.354	(0.015)
N400101	S1	15	0.638	(0.174)	2.898	(0.831)	0.500	(0.015)
N400102	S1	16	0.680	(0.177)	2.828	(0.784)	0.471	(0.015)
N401501	S2	1	0.345	(0.050)	0.855	(0.133)	0.349	(0.018)
N401702	S2	4	0.456	(0.086)	2.169	(0.420)	0.522	(0.015)
N401703	S2	5	0.444	(0.083)	2.174	(0.418)	0.492	(0.015)
N401801	S2	6	0.742	(0.102)	0.352	(0.084)	0.462	(0.021)
N401802	S2	7	0.592	(0.085)	-0.113	(0.061)	0.485	(0.022)
N401803	S2	8	0.593	(0.083)	0.749	(0.128)	0.500	(0.019)
N401804	S2	9	0.572	(0.090)	2.257	(0.376)	0.469	(0.015)
N401901	S2	10	0.514	(0.083)	2.637	(0.440)	0.329	(0.015)
N402001	S2	11	1.047	(0.132)	0.336	(0.093)	0.462	(0.020)
N402002	S2	12	1.123	(0.142)	0.407	(0.101)	0.489	(0.019)
N402003	S2	13	0.511	(0.192)	4.930	(1.918)	0.460	(0.013)
N402005	S2	15	0.852	(0.101)	0.931	(0.144)	0.481	(0.018)
N402201	S2	17	0.830	(0.062)	1.066	(0.096)	0.171	(0.014)
N402602	S2	21	0.589	(0.075)	0.757	(0.117)	0.471	(0.018)
N402603	S2	22	0.423	(0.144)	5.053	(1.783)	0.486	(0.013)
N402701	S2	23	0.559	(0.077)	2.741	(0.393)	0.207	(0.013)
N402801	S2	24	0.590	(0.193)	4.814	(1.638)	0.246	(0.010)
N402901	S2	25	0.517	(0.162)	5.032	(1.610)	0.179	(0.011)
N403201	S3	14	1.678	(0.160)	-0.556	(0.087)	0.232	(0.029)
N403202	S3	15	1.093	(0.088)	-0.186	(0.047)	0.145	(0.021)
N403301	S3	16	0.614	(0.067)	0.341	(0.059)	0.238	(0.020)
N403401	S3	17	0.776	(0.073)	1.819	(0.191)	0.292	(0.012)
N403601	S3	21	0.948	(0.080)	1.484	(0.153)	0.286	(0.014)
N403801	S3	25	0.574	(0.090)	1.981	(0.328)	0.453	(0.016)
N403802	S3	26	0.520	(0.164)	4.153	(1.350)	0.415	(0.014)
N403803	S3	27	0.772	(0.110)	0.518	(0.108)	0.516	(0.019)
N403804	S3	28	0.781	(0.109)	0.894	(0.153)	0.486	(0.018)
N404201	S3	31	0.647	(0.081)	2.413	(0.319)	0.204	(0.013)
N413601	S4	12	0.657	(0.070)	3.877	(0.421)	0.0	(0.0)
N412801	S4	14	0.865	(0.080)	0.756	(0.087)	0.207	(0.015)
N433601	S4	20	0.574	(0.060)	1.656	(0.182)	0.181	(0.013)
N412701	S4	22	0.791	(0.071)	2.035	(0.200)	0.143	(0.011)
N434501	S5	9	1.153	(0.058)	1.371	(0.086)	0.0	(0.0)
N433501	S6	9	0.424	(0.058)	-0.599	(0.091)	0.339	(0.023)
N416701	S6	15	0.867	(0.089)	0.089	(0.033)	0.0	(0.0)
N437701	S7	9	1.009	(0.078)	1.977	(0.184)	0.194	(0.010)
N438001	S7	12	0.692	(0.070)	1.583	(0.175)	0.292	(0.013)
N438201	S7	14	1.023	(0.096)	0.432	(0.065)	0.181	(0.016)
N438301	S7	15	0.460	(0.052)	0.763	(0.095)	0.204	(0.017)
N438401	S7	16	0.664	(0.081)	2.426	(0.312)	0.251	(0.011)
N438501	S7	17	0.902	(0.079)	1.929	(0.195)	0.241	(0.011)

Table E.19
1986 IRT Parameters, Science, Grade 7/Age 13
Life Sciences Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N404501	S1	12	0.890	(0.047)	-1.484	(0.085)	0.172	(0.028)
N404601	S1	13	0.676	(0.024)	0.565	(0.028)	0.248	(0.010)
N404701	S1	14	0.900	(0.056)	-0.635	(0.049)	0.223	(0.019)
N404702	S1	15	0.802	(0.052)	0.336	(0.035)	0.225	(0.012)
N400201	S1	16	0.769	(0.033)	-0.292	(0.023)	0.232	(0.013)
N405001	S1	23	0.474	(0.019)	0.478	(0.025)	0.205	(0.010)
N405201	S1	25	0.391	(0.020)	0.381	(0.026)	0.217	(0.010)
N401201	S1	28	1.202	(0.027)	0.808	(0.029)	0.265	(0.006)
N405601	S1	30	0.321	(0.042)	1.783	(0.236)	0.207	(0.010)
N405701	S1	31	1.454	(0.063)	0.887	(0.059)	0.198	(0.009)
N405801	S1	32	0.820	(0.051)	1.255	(0.086)	0.161	(0.009)
N405901	S1	33	0.895	(0.075)	1.970	(0.181)	0.198	(0.008)
N406001	S1	34	1.577	(0.034)	2.053	(0.071)	0.219	(0.005)
N406101	S1	35	1.184	(0.044)	2.550	(0.122)	0.255	(0.005)
N406201	S1	36	1.138	(0.030)	2.438	(0.080)	0.115	(0.004)
N412101	S4	10	0.825	(0.027)	-0.808	(0.032)	0.270	(0.011)
N412201	S4	11	1.630	(0.051)	-0.481	(0.029)	0.225	(0.009)
N415501	S4	16	2.438	(0.076)	1.050	(0.072)	0.197	(0.004)
N412301	S4	21	1.126	(0.064)	0.194	(0.027)	0.285	(0.007)
N419501	S5	3	0.683	(0.031)	-0.814	(0.041)	0.236	(0.015)
N419201	S5	4	1.345	(0.048)	-0.268	(0.024)	0.152	(0.013)
N419301	S5	7	0.919	(0.023)	0.437	(0.021)	0.141	(0.009)
N419401	S5	9	1.018	(0.023)	1.335	(0.039)	0.219	(0.006)
N420101	S5	10	0.759	(0.021)	0.903	(0.030)	0.163	(0.007)
N419101	S5	13	1.129	(0.026)	0.831	(0.029)	0.233	(0.007)
N418401	S6	11	1.073	(0.037)	0.010	(0.020)	0.199	(0.011)
N418301	S6	12	1.064	(0.041)	-0.124	(0.020)	0.199	(0.012)
N418201	S6	17	1.288	(0.031)	1.499	(0.053)	0.351	(0.006)
N418501	S6	20	0.581	(0.021)	1.743	(0.068)	0.216	(0.006)
N418101	S6	22	0.908	(0.025)	1.490	(0.049)	0.267	(0.006)
N417101	S6	27	1.286	(0.033)	2.117	(0.075)	0.217	(0.005)
N421101	S7	11	0.503	(0.042)	-0.409	(0.042)	0.236	(0.015)
N421301	S7	14	0.974	(0.053)	0.580	(0.044)	0.192	(0.010)
N421302	S7	15	1.184	(0.072)	0.233	(0.033)	0.184	(0.011)
N421401	S7	17	0.575	(0.043)	0.136	(0.026)	0.206	(0.013)
N433701	S7	18	0.738	(0.051)	0.961	(0.073)	0.216	(0.010)
N421201	S7	21	0.915	(0.060)	1.270	(0.095)	0.277	(0.008)
N423401	S8	15	1.301	(0.074)	-0.623	(0.048)	0.217	(0.019)
N423501	S8	18	1.048	(0.073)	-0.029	(0.028)	0.215	(0.013)
N423301	S8	23	0.978	(0.059)	0.849	(0.062)	0.232	(0.009)
N423601	S8	27	0.854	(0.066)	1.581	(0.133)	0.246	(0.008)
N435801	S9	22	1.336	(0.026)	1.064	(0.032)	0.179	(0.006)
N436301	S9	27	1.347	(0.077)	1.111	(0.086)	0.288	(0.008)
N436601	S9	31	1.166	(0.130)	2.287	(0.303)	0.232	(0.007)

Table E.20
1986 IRT Parameters, Science, Grade 7/Age 13
Chemistry Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N404901	S1	17	1.136	(0.076)	-0.317	(0.043)	0.259	(0.015)
N404902	S1	18	0.567	(0.213)	4.197	(1.655)	0.432	(0.008)
N404801	S1	20	1.057	(0.060)	-1.624	(0.111)	0.458	(0.033)
N404802	S1	21	1.721	(0.136)	-0.363	(0.062)	0.330	(0.016)
N404803	S1	22	1.184	(0.126)	0.248	(0.057)	0.341	(0.012)
N405101	S1	24	0.946	(0.039)	0.807	(0.047)	0.239	(0.008)
N405301	S1	26	1.053	(0.111)	0.900	(0.112)	0.216	(0.010)
N405401	S1	27	0.720	(0.032)	1.069	(0.055)	0.166	(0.008)
N405501	S1	29	0.613	(0.034)	0.267	(0.029)	0.197	(0.012)
N419801	S5	2	1.135	(0.068)	-0.433	(0.039)	0.319	(0.014)
N418701	S5	11	1.236	(0.041)	1.109	(0.054)	0.162	(0.006)
N418702	S5	12	0.508	(0.027)	1.461	(0.081)	0.148	(0.007)
N420201	S5	14	1.120	(0.043)	1.244	(0.067)	0.277	(0.007)
N420001	S5	15	0.849	(0.032)	1.135	(0.051)	0.112	(0.006)
N419701	S5	16	0.592	(0.031)	1.451	(0.081)	0.186	(0.007)
N419901	S5	17	0.473	(0.028)	1.195	(0.074)	0.187	(0.008)
N419601	S5	19	1.105	(0.047)	1.515	(0.088)	0.356	(0.007)
N423101	S8	17	0.702	(0.057)	-0.211	(0.034)	0.193	(0.015)
N423001	S8	21	0.547	(0.057)	0.199	(0.037)	0.211	(0.013)
N423201	S8	24	0.828	(0.081)	1.792	(0.181)	0.0	(0.0)
N422901	S8	29	0.789	(0.097)	0.657	(0.091)	0.225	(0.011)
N422801	S8	30	1.124	(0.123)	0.315	(0.053)	0.155	(0.011)
N436201	S9	26	0.729	(0.040)	1.253	(0.075)	0.171	(0.007)

Table E.21
1986 IRT Parameters, Science, Grade 7/Age 13
Nature of Science Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N408301	S3	10	2.513	(0.057)	0.800	(0.050)	0.358	(0.007)
N408302	S3	11	0.773	(0.043)	-0.458	(0.039)	0.404	(0.016)
N408303	S3	12	0.920	(0.045)	-0.574	(0.040)	0.410	(0.016)
N408304	S3	13	0.946	(0.054)	-0.362	(0.038)	0.424	(0.016)
N408401	S3	14	0.672	(0.049)	0.260	(0.032)	0.221	(0.012)
N408501	S3	15	0.963	(0.052)	-0.676	(0.046)	0.205	(0.019)
N408502	S3	16	0.614	(0.045)	1.060	(0.083)	0.156	(0.009)
N408601	S3	17	0.462	(0.024)	-0.376	(0.026)	0.196	(0.012)
N408701	S3	18	0.512	(0.043)	0.458	(0.047)	0.233	(0.012)
N408801	S3	19	0.634	(0.025)	0.460	(0.027)	0.195	(0.010)
N408901	S3	20	1.444	(0.060)	0.380	(0.040)	0.521	(0.009)
N408902	S3	21	1.553	(0.104)	-0.554	(0.057)	0.516	(0.016)
N408903	S3	22	1.003	(0.039)	0.563	(0.037)	0.419	(0.009)
N408904	S3	23	1.218	(0.043)	0.928	(0.052)	0.496	(0.008)
N409001	S3	24	0.865	(0.047)	0.283	(0.029)	0.137	(0.011)
N409101	S3	25	1.230	(0.078)	-0.239	(0.035)	0.299	(0.015)
N409102	S3	26	0.987	(0.061)	0.618	(0.051)	0.258	(0.010)
N409103	S3	27	0.798	(0.081)	1.871	(0.205)	0.342	(0.008)
N409201	S3	28	1.082	(0.073)	0.880	(0.077)	0.328	(0.010)
N409301	S3	29	1.362	(0.052)	0.232	(0.027)	0.167	(0.010)
N409501	S3	33	0.842	(0.026)	1.657	(0.060)	0.128	(0.006)
N409601	S3	34	1.471	(0.089)	1.349	(0.119)	0.296	(0.008)
N409701	S3	35	0.653	(0.077)	2.262	(0.275)	0.144	(0.008)
N434401	S4	15	0.887	(0.038)	-0.171	(0.020)	0.155	(0.009)
N413201	S4	17	1.771	(0.097)	0.413	(0.045)	0.367	(0.006)
N413401	S4	19	1.690	(0.099)	-0.115	(0.027)	0.178	(0.008)
N435001	S4	23	0.905	(0.055)	0.658	(0.049)	0.175	(0.010)
N434901	S4	27	0.916	(0.059)	0.922	(0.070)	0.248	(0.009)
N435501	S9	15	1.213	(0.066)	-0.717	(0.050)	0.197	(0.020)
N413701	S9	18	0.504	(0.020)	0.221	(0.017)	0.162	(0.008)
N436001	S9	24	0.728	(0.065)	0.390	(0.045)	0.253	(0.011)
N436401	S9	28	1.399	(0.061)	2.287	(0.145)	0.359	(0.005)
N436501	S9	29	1.895	(0.045)	0.678	(0.035)	0.135	(0.007)

Table E.22
1986 IRT Parameters, Science, Grade 7/Age 13
Physics Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N406701	S2	21	0.617	(0.055)	-0.222	(0.037)	0.197	(0.016)
N406901	S2	28	0.550	(0.033)	0.017	(0.022)	0.195	(0.012)
N407001	S2	29	0.368	(0.028)	0.241	(0.029)	0.219	(0.012)
N407101	S2	30	1.152	(0.038)	2.019	(0.091)	0.160	(0.006)
N407201	S2	31	0.555	(0.032)	0.762	(0.050)	0.219	(0.009)
N408001	S2	34	1.138	(0.114)	0.889	(0.109)	0.223	(0.010)
N407601	S2	35	0.890	(0.103)	0.687	(0.091)	0.163	(0.011)
N407901	S2	39	0.748	(0.107)	1.484	(0.225)	0.241	(0.011)
N413601	S4	12	0.627	(0.070)	1.888	(0.212)	0.0	(0.0)
N412801	S4	14	1.067	(0.053)	-0.935	(0.060)	0.191	(0.021)
N433601	S4	20	0.401	(0.049)	0.377	(0.054)	0.200	(0.014)
N412701	S4	22	0.603	(0.075)	0.692	(0.093)	0.195	(0.011)
N412601	S4	24	0.484	(0.136)	3.589	(1.013)	0.162	(0.007)
N421801	S7	10	0.466	(0.040)	-1.399	(0.123)	0.203	(0.022)
N421901	S7	16	0.681	(0.045)	-0.076	(0.023)	0.217	(0.012)
N421701	S7	24	0.350	(0.037)	2.919	(0.308)	0.220	(0.007)
N422001	S7	26	0.641	(0.113)	2.069	(0.372)	0.235	(0.009)
N421501	S7	27	0.512	(0.127)	3.132	(0.782)	0.239	(0.008)
N422101	S8	16	0.378	(0.029)	-0.907	(0.072)	0.209	(0.015)
N422201	S8	19	0.641	(0.040)	0.347	(0.031)	0.195	(0.010)
N422501	S8	22	0.889	(0.115)	0.549	(0.083)	0.216	(0.011)
N422301	S8	25	0.506	(0.069)	1.162	(0.163)	0.175	(0.011)
N422401	S8	26	0.666	(0.047)	2.305	(0.173)	0.285	(0.007)
N423701	S8	28	0.879	(0.105)	1.306	(0.168)	0.183	(0.009)
N421601	S8	32	0.134	(0.029)	6.522	(1.395)	0.202	(0.007)
N435401	S9	14	0.864	(0.050)	-0.513	(0.037)	0.185	(0.014)
N436701	S9	17	0.525	(0.055)	0.114	(0.033)	0.225	(0.014)
N435701	S9	21	0.521	(0.060)	0.749	(0.092)	0.197	(0.012)
N435901	S9	23	1.154	(0.046)	2.079	(0.106)	0.144	(0.005)
N436107	S9	25	0.872	(0.095)	1.114	(0.132)	0.177	(0.009)

Table E.23
1986 IRT Parameters, Science, Grade 7/Age 13
Earth and Space Science Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N406301	S2	10	0.328	(0.034)	-0.658	(0.073)	0.486	(0.014)
N406302	S2	11	0.427	(0.036)	0.638	(0.063)	0.458	(0.012)
N406303	S2	12	0.691	(0.041)	0.971	(0.070)	0.452	(0.010)
N406304	S2	13	0.537	(0.039)	0.618	(0.056)	0.395	(0.012)
N406401	S2	14	0.675	(0.044)	0.553	(0.052)	0.532	(0.011)
N406402	S2	15	1.042	(0.054)	0.598	(0.051)	0.439	(0.011)
N406403	S2	16	0.960	(0.077)	-0.387	(0.051)	0.533	(0.015)
N406404	S2	17	1.373	(0.089)	0.137	(0.047)	0.464	(0.013)
N406405	S2	18	0.865	(0.059)	0.024	(0.041)	0.486	(0.015)
N406501	S2	19	0.828	(0.064)	0.800	(0.076)	0.191	(0.013)
N406601	S2	20	0.628	(0.039)	0.129	(0.026)	0.257	(0.013)
N406801	S2	22	1.084	(0.063)	-0.834	(0.062)	0.420	(0.020)
N406802	S2	23	1.085	(0.055)	1.837	(0.122)	0.523	(0.007)
N406803	S2	24	0.958	(0.050)	-0.404	(0.036)	0.321	(0.015)
N406804	S2	25	0.899	(0.043)	-0.681	(0.044)	0.339	(0.017)
N406805	S2	26	1.630	(0.072)	1.526	(0.119)	0.601	(0.007)
N406806	S2	27	0.454	(0.030)	0.492	(0.042)	0.376	(0.012)
N407301	S2	32	0.326	(0.024)	1.568	(0.120)	0.239	(0.009)
N407302	S2	33	0.711	(0.048)	2.258	(0.165)	0.426	(0.008)
N407701	S2	37	0.637	(0.027)	1.161	(0.057)	0.167	(0.009)
N407801	S2	38	0.807	(0.091)	2.299	(0.287)	0.270	(0.010)
N408201	S2	40	1.169	(0.108)	2.347	(0.279)	0.205	(0.009)
N412901	S4	13	0.896	(0.069)	-0.528	(0.053)	0.244	(0.018)
N416401	S4	26	0.956	(0.095)	-0.002	(0.037)	0.231	(0.015)
N435201	S5	6	0.908	(0.055)	0.356	(0.036)	0.311	(0.010)
N417601	S6	13	1.283	(0.059)	0.247	(0.033)	0.278	(0.010)
N418001	S6	15	0.711	(0.032)	-0.009	(0.022)	0.199	(0.012)
N435101	S6	16	0.820	(0.034)	0.114	(0.023)	0.175	(0.011)
N417801	S6	19	1.488	(0.040)	0.987	(0.047)	0.229	(0.007)
N417701	S6	21	1.855	(0.050)	0.926	(0.052)	0.264	(0.007)
N414401	S6	23	0.937	(0.030)	1.030	(0.043)	0.248	(0.006)
N416801	S6	25	1.025	(0.033)	1.309	(0.057)	0.277	(0.007)
N417901	S6	26	1.050	(0.031)	1.766	(0.067)	0.193	(0.006)
N420601	S7	13	0.533	(0.057)	0.185	(0.038)	0.256	(0.015)
N420401	S7	19	0.888	(0.097)	0.039	(0.038)	0.257	(0.014)
N420501	S7	20	1.490	(0.141)	1.727	(0.240)	0.324	(0.008)
N420701	S7	22	0.854	(0.082)	3.190	(0.320)	0.0	(0.0)
N420301	S7	23	0.667	(0.071)	1.826	(0.203)	0.174	(0.009)
N413001	S9	16	1.111	(0.071)	-0.605	(0.055)	0.241	(0.019)
N413101	S9	19	1.095	(0.091)	-0.239	(0.042)	0.215	(0.016)
N435601	S9	20	0.545	(0.058)	0.629	(0.077)	0.279	(0.013)
N417401	S9	30	1.276	(0.044)	1.821	(0.092)	0.281	(0.007)

Table E.24
1986 IRT Parameters, Science, Grade 11/Age 17
Life Sciences Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N400201	S1	12	0.769	(0.033)	-0.292	(0.023)	0.232	(0.013)
N404601	S1	13	0.676	(0.024)	0.565	(0.028)	0.248	(0.010)
N410001	S1	14	0.638	(0.132)	4.270	(0.920)	0.518	(0.007)
N410003	S1	16	0.554	(0.043)	-0.719	(0.066)	0.533	(0.019)
N410004	S1	17	0.590	(0.039)	0.199	(0.038)	0.554	(0.015)
N409901	S1	18	0.921	(0.036)	0.156	(0.028)	0.221	(0.018)
N405001	S1	29	0.474	(0.019)	0.478	(0.025)	0.205	(0.010)
N401201	S1	30	1.202	(0.027)	0.808	(0.029)	0.265	(0.006)
N405201	S1	31	0.391	(0.020)	0.381	(0.026)	0.217	(0.010)
N406001	S1	33	1.577	(0.034)	2.053	(0.071)	0.219	(0.005)
N406101	S1	35	1.184	(0.044)	2.550	(0.122)	0.255	(0.005)
N410301	S1	36	0.469	(0.118)	6.652	(1.688)	0.080	(0.004)
N406201	S1	37	1.138	(0.030)	2.438	(0.080)	0.115	(0.004)
N430401	S4	12	0.988	(0.053)	-0.302	(0.033)	0.221	(0.022)
N433801	S4	16	0.697	(0.024)	1.123	(0.046)	0.211	(0.011)
N430001	S4	20	1.214	(0.046)	2.588	(0.127)	0.207	(0.006)
N430002	S4	21	0.229	(0.022)	0.514	(0.054)	0.297	(0.014)
N430003	S4	22	0.428	(0.023)	0.419	(0.031)	0.232	(0.014)
N430301	S4	30	0.771	(0.045)	2.926	(0.184)	0.256	(0.007)
N419501	S5	3	0.683	(0.031)	-0.814	(0.041)	0.236	(0.015)
N419201	S5	4	1.345	(0.048)	-0.268	(0.024)	0.152	(0.013)
N419301	S5	7	0.919	(0.023)	0.437	(0.021)	0.141	(0.009)
N419401	S5	9	1.018	(0.023)	1.335	(0.039)	0.219	(0.006)
N420101	S5	10	0.759	(0.021)	0.903	(0.030)	0.163	(0.007)
N419101	S5	13	1.129	(0.026)	0.831	(0.029)	0.233	(0.007)
N418401	S6	11	1.073	(0.037)	0.010	(0.020)	0.199	(0.011)
N418301	S6	12	1.064	(0.041)	-0.124	(0.020)	0.199	(0.012)
N418201	S6	17	1.288	(0.031)	1.499	(0.053)	0.351	(0.006)
N418501	S6	20	0.581	(0.021)	1.743	(0.068)	0.216	(0.006)
N418101	S6	22	0.908	(0.025)	1.490	(0.049)	0.267	(0.006)
N417101	S6	27	1.286	(0.033)	2.117	(0.075)	0.217	(0.005)
N427801	S7	18	1.368	(0.048)	0.288	(0.032)	0.229	(0.016)
N428101	S7	21	0.577	(0.032)	2.965	(0.172)	0.216	(0.007)
N428102	S7	22	1.075	(0.040)	0.167	(0.029)	0.255	(0.017)
N428001	S7	25	0.922	(0.026)	1.538	(0.054)	0.262	(0.009)
N428201	S7	26	0.434	(0.018)	2.685	(0.114)	0.0	(0.0)
N428301	S7	27	1.521	(0.033)	1.047	(0.042)	0.275	(0.010)
N427901	S7	32	0.878	(0.025)	1.691	(0.059)	0.231	(0.009)
N431201	S8	14	0.703	(0.030)	0.020	(0.024)	0.236	(0.017)
N431301	S8	19	0.842	(0.019)	2.125	(0.053)	0.0	(0.0)
N432701	S8	21	1.290	(0.030)	0.909	(0.037)	0.237	(0.011)
N432601	S8	22	0.703	(0.025)	1.447	(0.060)	0.290	(0.010)
N432901	S8	24	1.312	(0.030)	0.959	(0.038)	0.239	(0.011)
N432801	S8	29	0.445	(0.022)	1.752	(0.092)	0.231	(0.010)
N424301	S9	19	0.886	(0.030)	0.429	(0.029)	0.225	(0.015)
N424701	S9	21	1.088	(0.041)	0.193	(0.029)	0.245	(0.017)
N424501	S9	27	0.769	(0.023)	0.754	(0.032)	0.172	(0.013)
N424401	S9	31	1.538	(0.032)	1.679	(0.060)	0.302	(0.008)
N426601	S9	32	1.150	(0.028)	2.068	(0.068)	0.195	(0.007)
N424201	S9	36	1.345	(0.025)	1.463	(0.043)	0.137	(0.008)
N427001	S10	21	1.221	(0.027)	1.122	(0.039)	0.211	(0.010)
N427101	S10	23	0.819	(0.024)	1.280	(0.047)	0.240	(0.010)
N426501	S10	26	0.459	(0.024)	2.326	(0.126)	0.233	(0.009)
N426901	S10	28	0.629	(0.026)	2.177	(0.096)	0.240	(0.009)
N426801	S10	29	0.600	(0.025)	2.126	(0.094)	0.222	(0.009)
N434201	S10	33	1.338	(0.031)	2.124	(0.073)	0.155	(0.007)
N434202	S10	34	1.527	(0.032)	1.748	(0.061)	0.192	(0.008)
N437202	S11	19	1.436	(0.028)	1.146	(0.038)	0.159	(0.009)
N435801	S11	20	1.336	(0.026)	1.064	(0.032)	0.179	(0.006)

Table E.25
1986 IRT Parameters, Science, Grade 11/Age 17
Chemistry Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N407403	S2	30	0.465	(0.067)	0.384	(0.074)	0.448	(0.020)
N407404	S2	31	0.464	(0.081)	-0.962	(0.175)	0.439	(0.028)
N405101	S3	14	0.946	(0.039)	0.807	(0.047)	0.239	(0.008)
N405401	S3	19	0.720	(0.032)	1.069	(0.055)	0.166	(0.008)
N411301	S3	20	0.708	(0.107)	4.437	(0.716)	0.127	(0.009)
N405501	S3	21	0.613	(0.034)	0.267	(0.029)	0.197	(0.012)
N411101	S3	22	0.562	(0.035)	1.026	(0.075)	0.225	(0.015)
N411401	S3	25	2.033	(0.067)	1.035	(0.078)	0.193	(0.012)
N411601	S3	28	0.924	(0.040)	1.546	(0.087)	0.208	(0.012)
N411701	S3	29	0.910	(0.038)	1.779	(0.092)	0.150	(0.011)
N411801	S3	30	1.710	(0.055)	1.104	(0.072)	0.173	(0.012)
N412001	S3	32	0.924	(0.053)	2.459	(0.171)	0.237	(0.012)
N429901	S4	13	0.366	(0.047)	-0.727	(0.099)	0.212	(0.023)
N429601	S4	25	0.514	(0.042)	1.902	(0.163)	0.219	(0.012)
N429801	S4	27	0.384	(0.040)	1.713	(0.183)	0.220	(0.014)
N429701	S4	29	0.534	(0.046)	1.767	(0.161)	0.250	(0.013)
N419801	S5	2	1.135	(0.068)	-0.433	(0.039)	0.319	(0.014)
N418701	S5	11	1.236	(0.041)	1.109	(0.054)	0.162	(0.006)
N418702	S5	12	0.508	(0.027)	1.461	(0.081)	0.148	(0.007)
N420201	S5	14	1.120	(0.043)	1.244	(0.067)	0.277	(0.007)
N420001	S5	15	0.849	(0.032)	1.135	(0.051)	0.112	(0.006)
N419701	S5	16	0.592	(0.031)	1.451	(0.081)	0.186	(0.007)
N419901	S5	17	0.473	(0.028)	1.195	(0.074)	0.187	(0.008)
N419601	S5	19	1.105	(0.047)	1.515	(0.088)	0.356	(0.007)
N427601	S7	19	0.194	(0.029)	-0.241	(0.046)	0.222	(0.020)
N427501	S7	20	0.661	(0.073)	-0.199	(0.041)	0.214	(0.022)
N433901	S7	33	1.843	(0.069)	1.854	(0.133)	0.210	(0.009)
N427701	S7	35	1.927	(0.064)	2.179	(0.145)	0.113	(0.007)
N432201	S8	23	1.657	(0.067)	2.661	(0.189)	0.102	(0.006)
N432301	S8	30	1.516	(0.061)	2.036	(0.134)	0.168	(0.009)
N432501	S8	32	0.707	(0.046)	1.949	(0.139)	0.238	(0.011)
N434101	S8	33	0.764	(0.052)	2.362	(0.182)	0.272	(0.011)
N423901	S9	22	0.961	(0.061)	0.779	(0.068)	0.263	(0.015)
N423902	S9	23	0.583	(0.046)	2.195	(0.183)	0.345	(0.012)
N424001	S9	34	1.361	(0.088)	2.805	(0.275)	0.284	(0.009)
N435301	S9	37	1.075	(0.075)	3.112	(0.281)	0.205	(0.008)
N427201	S10	18	0.455	(0.044)	-0.167	(0.035)	0.220	(0.021)
N427202	S10	19	0.792	(0.050)	0.716	(0.060)	0.212	(0.016)
N427401	S10	24	0.580	(0.040)	1.035	(0.080)	0.228	(0.015)
N425701	S10	30	0.876	(0.035)	2.877	(0.130)	0.0	(0.0)
N436201	S11	24	0.729	(0.040)	1.253	(0.075)	0.171	(0.007)
N437301	S11	25	0.699	(0.047)	2.847	(0.207)	0.137	(0.009)
N437401	S11	27	0.806	(0.042)	1.822	(0.108)	0.138	(0.011)
N437501	S11	29	0.995	(0.059)	2.465	(0.182)	0.207	(0.009)

Table E.26
1986 IRT Parameters, Science, Grade 11/Age 17
Nature of Science Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N408601	S1	19	0.462	(0.024)	-0.376	(0.026)	0.196	(0.012)
N409301	S1	20	1.362	(0.052)	0.232	(0.027)	0.167	(0.010)
N410101	S1	25	0.707	(0.048)	0.272	(0.045)	0.489	(0.018)
N410102	S1	26	0.432	(0.037)	0.674	(0.069)	0.476	(0.016)
N410103	S1	27	0.607	(0.051)	-0.401	(0.053)	0.461	(0.023)
N409501	S1	34	0.842	(0.026)	1.657	(0.060)	0.128	(0.006)
N408301	S3	10	2.513	(0.057)	0.800	(0.050)	0.358	(0.007)
N408302	S3	11	0.773	(0.043)	-0.458	(0.039)	0.404	(0.016)
N408303	S3	12	0.920	(0.045)	-0.574	(0.040)	0.410	(0.016)
N408304	S3	13	0.946	(0.054)	-0.362	(0.038)	0.424	(0.016)
N408901	S3	15	1.444	(0.060)	0.380	(0.040)	0.521	(0.009)
N408902	S3	16	1.553	(0.104)	-0.554	(0.057)	0.516	(0.016)
N408903	S3	17	1.003	(0.039)	0.563	(0.037)	0.419	(0.009)
N408904	S3	18	1.218	(0.043)	0.928	(0.052)	0.496	(0.008)
N411201	S3	23	0.730	(0.030)	1.372	(0.067)	0.251	(0.012)
N408801	S3	24	0.634	(0.025)	0.460	(0.027)	0.195	(0.010)
N411501	S3	26	1.666	(0.042)	1.928	(0.084)	0.187	(0.008)
N411502	S3	27	0.764	(0.044)	0.110	(0.037)	0.314	(0.021)
N428901	S7	24	0.832	(0.032)	1.234	(0.059)	0.236	(0.012)
N428801	S7	28	1.093	(0.034)	1.201	(0.053)	0.199	(0.011)
N434001	S7	29	1.073	(0.079)	2.944	(0.271)	0.373	(0.008)
N428601	S7	30	1.146	(0.033)	1.640	(0.064)	0.166	(0.009)
N429001	S7	37	1.007	(0.048)	2.996	(0.171)	0.094	(0.006)
N431901	S8	17	1.178	(0.049)	0.395	(0.037)	0.181	(0.017)
N431902	S8	18	0.870	(0.029)	1.964	(0.076)	0.114	(0.008)
N432401	S8	25	1.226	(0.042)	0.650	(0.041)	0.164	(0.015)
N425201	S9	26	0.827	(0.032)	1.095	(0.053)	0.163	(0.013)
N425301	S9	30	0.674	(0.031)	1.335	(0.068)	0.182	(0.012)
N425401	S9	33	1.196	(0.067)	2.686	(0.196)	0.226	(0.008)
N425901	S10	22	0.724	(0.032)	1.778	(0.087)	0.181	(0.010)
N425801	S10	25	0.680	(0.035)	1.983	(0.111)	0.222	(0.010)
N413701	S11	12	0.504	(0.020)	0.221	(0.017)	0.162	(0.008)
N436901	S11	15	0.996	(0.031)	1.248	(0.051)	0.173	(0.011)
N436501	S11	21	1.895	(0.045)	0.678	(0.035)	0.135	(0.007)
N436401	S11	22	1.399	(0.081)	2.287	(0.145)	0.359	(0.005)
N432001	S11	28	1.380	(0.045)	2.323	(0.110)	0.121	(0.007)

Table E.27
1986 IRT Parameters, Science, Grade 11/Age 17
Physics Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N410401	S2	15	0.349	(0.036)	0.316	(0.044)	0.267	(0.017)
N410501	S2	22	0.402	(0.036)	0.318	(0.041)	0.228	(0.018)
N410601	S2	23	1.909	(0.051)	1.900	(0.102)	0.129	(0.007)
N410602	S2	24	0.430	(0.061)	-2.279	(0.326)	0.343	(0.034)
N410603	S2	25	1.145	(0.049)	1.580	(0.094)	0.335	(0.010)
N410604	S2	26	0.351	(0.047)	-2.514	(0.341)	0.348	(0.032)
N406901	S2	27	0.550	(0.033)	0.017	(0.022)	0.195	(0.012)
N407401	S2	28	0.582	(0.041)	0.591	(0.054)	0.321	(0.015)
N407402	S2	29	0.240	(0.040)	2.515	(0.426)	0.386	(0.014)
N407201	S2	32	0.555	(0.032)	0.762	(0.050)	0.219	(0.009)
N407001	S2	33	0.368	(0.028)	0.241	(0.029)	0.219	(0.012)
N410701	S2	34	0.754	(0.041)	1.423	(0.089)	0.264	(0.012)
N407101	S2	38	1.152	(0.038)	2.019	(0.091)	0.160	(0.006)
N410801	S2	39	0.715	(0.040)	1.828	(0.113)	0.223	(0.011)
N410901	S2	40	0.971	(0.035)	1.774	(0.080)	0.123	(0.009)
N411001	S2	41	0.932	(0.045)	2.452	(0.142)	0.178	(0.008)
N411901	S3	31	0.653	(0.057)	2.503	(0.230)	0.206	(0.010)
N421901	S4	14	0.681	(0.045)	-0.076	(0.023)	0.217	(0.012)
N430801	S4	17	0.805	(0.039)	0.781	(0.046)	0.0	(0.0)
N429401	S4	19	0.848	(0.059)	2.634	(0.203)	0.204	(0.008)
N421601	S4	24	0.134	(0.029)	6.522	(1.395)	0.202	(0.007)
N430501	S4	26	0.746	(0.043)	1.229	(0.082)	0.225	(0.012)
N430601	S4	28	0.402	(0.037)	0.803	(0.080)	0.205	(0.015)
N432101	S8	16	0.900	(0.055)	0.380	(0.040)	0.176	(0.016)
N431401	S8	20	0.820	(0.055)	0.131	(0.033)	0.187	(0.017)
N421701	S8	26	0.350	(0.037)	2.919	(0.308)	0.220	(0.007)
N422401	S8	27	0.666	(0.047)	2.305	(0.173)	0.285	(0.007)
N431101	S8	31	0.548	(0.038)	1.376	(0.101)	0.183	(0.012)
N423801	S9	18	0.584	(0.042)	-0.012	(0.029)	0.187	(0.018)
N425001	S9	20	0.488	(0.040)	-0.312	(0.038)	0.193	(0.020)
N424801	S9	24	0.783	(0.045)	0.561	(0.047)	0.226	(0.015)
N424802	S9	25	0.873	(0.031)	1.397	(0.058)	0.0	(0.0)
N424901	S9	28	0.388	(0.033)	0.721	(0.067)	0.227	(0.015)
N425501	S9	29	0.810	(0.040)	0.782	(0.051)	0.152	(0.013)
N426101	S10	16	0.320	(0.040)	-0.561	(0.075)	0.209	(0.020)
N422201	S10	17	0.641	(0.040)	0.347	(0.031)	0.195	(0.010)
N426401	S10	20	0.243	(0.036)	2.055	(0.308)	0.219	(0.013)
N425601	S10	27	0.335	(0.095)	6.641	(1.885)	0.147	(0.007)
N426201	S10	32	0.838	(0.049)	1.569	(0.104)	0.210	(0.011)
N427301	S10	35	0.448	(0.048)	2.537	(0.277)	0.208	(0.011)
N435401	S11	10	0.864	(0.050)	-0.513	(0.037)	0.185	(0.014)
N422101	S11	11	0.378	(0.029)	-0.907	(0.072)	0.209	(0.015)
N437001	S11	16	1.033	(0.037)	2.709	(0.113)	0.0	(0.0)
N435901	S11	23	1.154	(0.046)	2.079	(0.106)	0.144	(0.005)

Table E.28
1986 IRT Parameters, Science, Grade 11/Age 17
Earth and Space Sciences Subscale

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N406301	S1	21	0.328	(0.034)	-0.658	(0.073)	0.486	(0.014)
N406302	S1	22	0.427	(0.036)	0.638	(0.063)	0.458	(0.012)
N406303	S1	23	0.691	(0.041)	0.971	(0.070)	0.452	(0.010)
N406304	S1	24	0.537	(0.039)	0.618	(0.056)	0.395	(0.012)
N406601	S1	28	0.628	(0.039)	0.129	(0.026)	0.257	(0.013)
N410201	S1	32	0.674	(0.046)	2.454	(0.182)	0.250	(0.011)
N408101	S1	38	0.861	(0.041)	2.224	(0.121)	0.165	(0.010)
N406401	S2	10	0.675	(0.044)	0.553	(0.052)	0.532	(0.011)
N406402	S2	11	1.042	(0.054)	0.598	(0.051)	0.439	(0.011)
N406403	S2	12	0.960	(0.077)	-0.387	(0.051)	0.533	(0.015)
N406404	S2	13	1.373	(0.089)	0.137	(0.047)	0.464	(0.013)
N406405	S2	14	0.865	(0.059)	0.024	(0.041)	0.486	(0.015)
N406801	S2	16	1.084	(0.063)	-0.834	(0.062)	0.420	(0.020)
N406802	S2	17	1.085	(0.055)	1.837	(0.122)	0.523	(0.007)
N406803	S2	18	0.958	(0.050)	-0.404	(0.036)	0.321	(0.015)
N406804	S2	19	0.899	(0.043)	-0.681	(0.044)	0.339	(0.017)
N406805	S2	20	1.630	(0.072)	1.526	(0.119)	0.601	(0.007)
N406806	S2	21	0.454	(0.030)	0.492	(0.042)	0.376	(0.012)
N407701	S2	35	0.637	(0.027)	1.161	(0.057)	0.167	(0.009)
N407301	S2	36	0.326	(0.024)	1.568	(0.120)	0.239	(0.009)
N407302	S2	37	0.711	(0.048)	2.258	(0.165)	0.426	(0.008)
N434801	S4	15	0.728	(0.039)	1.442	(0.090)	0.314	(0.012)
N434301	S4	18	1.192	(0.043)	1.193	(0.062)	0.178	(0.012)
N435201	S5	6	0.908	(0.055)	0.356	(0.036)	0.311	(0.010)
N417601	S6	13	1.283	(0.059)	0.247	(0.033)	0.278	(0.010)
N418001	S6	15	0.711	(0.032)	-0.009	(0.022)	0.199	(0.012)
N435101	S6	16	0.820	(0.034)	0.114	(0.023)	0.175	(0.011)
N417801	S6	19	1.488	(0.040)	0.987	(0.047)	0.229	(0.007)
N417701	S6	21	1.855	(0.050)	0.926	(0.052)	0.264	(0.007)
N414401	S6	23	0.937	(0.030)	1.030	(0.043)	0.248	(0.006)
N416801	S6	25	1.025	(0.033)	1.309	(0.057)	0.277	(0.007)
N417901	S6	26	1.050	(0.031)	1.766	(0.067)	0.193	(0.006)
N428501	S7	23	1.619	(0.074)	0.690	(0.061)	0.240	(0.015)
N429201	S7	31	0.267	(0.032)	1.994	(0.243)	0.271	(0.014)
N428401	S7	34	0.875	(0.050)	2.428	(0.159)	0.236	(0.009)
N436801	S11	13	1.195	(0.044)	1.167	(0.063)	0.199	(0.012)
N436802	S11	14	1.455	(0.048)	1.781	(0.094)	0.234	(0.009)
N437101	S11	17	1.174	(0.048)	1.905	(0.107)	0.312	(0.010)
N417401	S11	26	1.276	(0.044)	1.821	(0.092)	0.281	(0.007)

Table E.29
1986 IRT Parameters, U.S. History, Grade 11/Age 17

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
H000101	H1	13	1.159	(0.086)	-0.128	(0.067)	0.186	(0.029)
H000201	H1	14	1.291	(0.153)	1.224	(0.247)	0.235	(0.017)
H000301	H1	15	0.601	(0.052)	-1.220	(0.127)	0.216	(0.054)
H000401	H1	16	0.407	(0.054)	-0.381	(0.122)	0.301	(0.064)
H000501	H1	17	1.181	(0.103)	0.147	(0.089)	0.243	(0.029)
H000601	H1	18	0.364	(0.044)	-0.447	(0.105)	0.231	(0.057)
H000701	H1	19	1.556	(0.159)	1.989	(0.339)	0.188	(0.010)
H000801	H1	20	0.900	(0.084)	-2.362	(0.248)	0.213	(0.054)
H000901	H1	21	1.167	(0.106)	0.788	(0.134)	0.154	(0.018)
H001001	H1	22	0.751	(0.069)	0.056	(0.082)	0.196	(0.038)
H001101	H1	23	0.625	(0.061)	-0.147	(0.085)	0.202	(0.046)
H001201	H1	24	1.813	(0.123)	-0.397	(0.066)	0.153	(0.024)
H001202	H1	25	1.208	(0.095)	-1.239	(0.127)	0.223	(0.046)
H001203	H1	26	0.673	(0.059)	-0.244	(0.076)	0.198	(0.041)
H001204	H1	27	1.447	(0.112)	-0.479	(0.077)	0.258	(0.033)
H001205	H1	28	1.401	(0.120)	-1.517	(0.177)	0.230	(0.049)
H001301	H1	29	1.059	(0.091)	-0.445	(0.087)	0.291	(0.041)
H001401	H1	30	0.385	(0.041)	-1.202	(0.149)	0.225	(0.056)
H001501	H1	31	0.728	(0.057)	-0.563	(0.078)	0.179	(0.042)
H001601	H1	32	0.601	(0.054)	-1.495	(0.154)	0.236	(0.059)
H001701	H1	33	1.106	(0.106)	0.486	(0.118)	0.222	(0.026)
H001801	H1	34	0.882	(0.156)	1.664	(0.386)	0.322	(0.022)
H001901	H1	35	0.383	(0.058)	0.658	(0.160)	0.234	(0.055)
H002001	H1	36	0.529	(0.062)	0.203	(0.103)	0.237	(0.048)
H002101	H1	37	1.064	(0.110)	0.704	(0.144)	0.233	(0.024)
H002201	H1	38	0.602	(0.060)	-0.798	(0.117)	0.264	(0.059)
H002301	H1	39	1.190	(0.147)	1.839	(0.326)	0.172	(0.012)
H002401	H1	40	0.444	(0.088)	1.622	(0.369)	0.260	(0.045)
H002402	H1	41	0.828	(0.067)	-1.466	(0.139)	0.213	(0.051)
H002403	H1	42	0.911	(0.107)	1.551	(0.236)	0.110	(0.016)
H002404	H1	43	0.924	(0.145)	1.741	(0.357)	0.197	(0.019)
H002501	H1	44	0.651	(0.057)	-0.922	(0.108)	0.215	(0.052)
H002601	H1	45	0.878	(0.104)	0.706	(0.156)	0.270	(0.030)
H002701	H1	46	0.791	(0.101)	1.220	(0.213)	0.187	(0.025)
H002801	H1	47	1.432	(0.168)	1.962	(0.367)	0.261	(0.012)
H002901	H1	48	0.848	(0.075)	-0.754	(0.102)	0.252	(0.051)
H003001	H2	13	1.209	(0.097)	-0.740	(0.092)	0.248	(0.042)
H003101	H2	14	0.725	(0.071)	0.025	(0.087)	0.226	(0.041)
H003201	H2	15	0.680	(0.101)	1.428	(0.264)	0.205	(0.028)
H003301	H2	16	0.758	(0.082)	0.268	(0.105)	0.243	(0.039)
H003401	H2	17	1.337	(0.191)	1.990	(0.437)	0.342	(0.013)
H003501	H2	18	0.973	(0.137)	1.199	(0.254)	0.294	(0.023)
H003601	H2	19	0.966	(0.104)	0.474	(0.125)	0.281	(0.030)
H002405	H2	20	1.772	(0.170)	0.938	(0.205)	0.208	(0.014)
H002406	H2	21	2.475	(0.237)	0.665	(0.211)	0.334	(0.015)
H002407	H2	22	1.785	(0.179)	0.942	(0.219)	0.275	(0.015)
H002408	H2	23	1.175	(0.129)	0.554	(0.146)	0.315	(0.026)
H003701	H2	24	1.560	(0.178)	1.426	(0.304)	0.393	(0.014)
H003801	H2	25	0.952	(0.103)	1.109	(0.177)	0.143	(0.020)
H003901	H2	26	0.836	(0.075)	-0.086	(0.079)	0.211	(0.038)
H004001	H2	27	0.822	(0.097)	0.516	(0.136)	0.299	(0.034)
H004101	H2	28	0.989	(0.122)	0.377	(0.143)	0.399	(0.033)
H004201	H2	29	0.693	(0.319)	4.222	(2.157)	0.190	(0.010)
H004301	H2	30	0.380	(0.098)	2.340	(0.649)	0.354	(0.042)
H004401	H2	31	0.862	(0.094)	-0.113	(0.104)	0.357	(0.043)
H004501	H2	32	0.327	(0.041)	-2.027	(0.265)	0.253	(0.064)
H004502	H2	33	0.593	(0.055)	-0.575	(0.093)	0.216	(0.049)
H004601	H2	34	0.484	(0.050)	0.093	(0.081)	0.179	(0.043)
H004701	H2	35	0.588	(0.053)	-1.938	(0.186)	0.205	(0.052)
H004801	H2	36	1.131	(0.168)	1.628	(0.351)	0.209	(0.016)
H004901	H2	37	0.464	(0.046)	-0.765	(0.107)	0.213	(0.052)
H005001	H2	38	1.437	(0.113)	-0.612	(0.084)	0.242	(0.036)
H005101	H2	39	1.468	(0.149)	1.067	(0.205)	0.163	(0.015)
H005102	H2	40	1.357	(0.097)	-0.506	(0.070)	0.160	(0.032)
H005103	H2	41	1.250	(0.094)	-0.313	(0.068)	0.184	(0.032)
H005201	H2	42	0.792	(0.064)	0.297	(0.073)	0.131	(0.027)
H005301	H2	43	0.390	(0.068)	0.923	(0.217)	0.268	(0.055)
H005401	H2	44	0.921	(0.074)	-0.325	(0.073)	0.188	(0.037)
H005501	H2	45	0.640	(0.095)	1.417	(0.257)	0.190	(0.029)
H005601	H2	46	1.041	(0.097)	0.284	(0.097)	0.220	(0.029)
H005701	H2	47	0.822	(0.105)	1.182	(0.210)	0.191	(0.025)
H005801	H2	48	0.676	(0.060)	-1.415	(0.145)	0.226	(0.055)
H005901	H3	13	1.055	(0.090)	0.171	(0.082)	0.217	(0.028)

Table E.29
(continued)

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
H006001	H3	14	1.025	(0.083)	-0.439	(0.078)	0.229	(0.039)
H006101	H3	15	1.115	(0.086)	-1.351	(0.132)	0.208	(0.047)
H006201	H3	16	0.647	(0.104)	1.613	(0.308)	0.191	(0.027)
H006301	H3	17	1.109	(0.101)	-0.159	(0.085)	0.289	(0.036)
H006401	H3	18	0.942	(0.119)	1.637	(0.267)	0.120	(0.015)
H006501	H3	19	0.621	(0.168)	2.572	(0.768)	0.335	(0.023)
H006601	H3	20	0.636	(0.084)	0.833	(0.165)	0.217	(0.036)
H006701	H3	21	1.035	(0.179)	2.193	(0.489)	0.167	(0.013)
H006801	H3	22	1.418	(0.115)	-0.149	(0.074)	0.268	(0.029)
H006901	H3	23	0.246	(0.054)	3.231	(0.725)	0.246	(0.037)
H007001	H3	24	1.173	(0.092)	0.187	(0.077)	0.167	(0.024)
H007101	H3	25	0.859	(0.132)	1.484	(0.301)	0.238	(0.022)
H007102	H3	26	1.133	(0.090)	0.106	(0.074)	0.189	(0.026)
H007103	H3	27	0.844	(0.078)	-0.364	(0.088)	0.275	(0.044)
H007201	H3	28	0.698	(0.118)	1.025	(0.248)	0.366	(0.035)
H007301	H3	29	0.859	(0.112)	1.557	(0.259)	0.130	(0.018)
H007401	H3	30	0.774	(0.134)	1.607	(0.347)	0.275	(0.024)
H007501	H3	31	0.881	(0.087)	0.435	(0.105)	0.206	(0.030)
H007601	H3	32	1.189	(0.152)	1.138	(0.242)	0.272	(0.019)
H007701	H3	33	1.755	(0.142)	-0.281	(0.075)	0.270	(0.028)
H007801	H3	34	0.759	(0.070)	0.255	(0.084)	0.176	(0.033)
H007901	H3	35	0.995	(0.232)	2.356	(0.702)	0.338	(0.015)
H008001	H3	36	0.872	(0.139)	1.693	(0.344)	0.211	(0.020)
H008101	H3	37	0.633	(0.070)	0.505	(0.111)	0.183	(0.037)
H008201	H3	38	0.535	(0.088)	1.599	(0.303)	0.178	(0.033)
H008301	H3	39	1.092	(0.102)	1.203	(0.166)	0.092	(0.014)
H008302	H3	40	0.801	(0.073)	0.421	(0.091)	0.151	(0.029)
H008303	H3	41	0.688	(0.084)	0.285	(0.119)	0.278	(0.044)
H008304	H3	42	0.836	(0.072)	-0.438	(0.083)	0.225	(0.044)
H008305	H3	43	0.624	(0.111)	1.664	(0.350)	0.252	(0.029)
H008401	H3	44	1.098	(0.099)	0.091	(0.087)	0.246	(0.031)
H008501	H3	45	0.524	(0.055)	-2.574	(0.280)	0.233	(0.059)
H008601	H3	46	0.426	(0.060)	0.676	(0.149)	0.223	(0.048)
H008701	H3	47	0.507	(0.094)	1.246	(0.286)	0.299	(0.043)
H008801	H4	13	0.698	(0.068)	0.021	(0.086)	0.207	(0.041)
H008901	H4	14	1.249	(0.108)	0.355	(0.099)	0.230	(0.024)
H009001	H4	15	0.981	(0.088)	0.825	(0.123)	0.143	(0.020)
H009101	H4	16	0.865	(0.070)	-1.444	(0.139)	0.235	(0.053)
H005004	H4	17	1.087	(0.077)	-0.003	(0.061)	0.116	(0.025)
H005005	H4	18	0.899	(0.067)	-0.402	(0.069)	0.149	(0.036)
H005006	H4	19	1.082	(0.085)	-0.015	(0.070)	0.175	(0.029)
H005007	H4	20	1.718	(0.154)	1.315	(0.240)	0.300	(0.013)
H005008	H4	21	1.300	(0.078)	-0.289	(0.052)	0.085	(0.021)
H005009	H4	22	0.799	(0.059)	0.028	(0.060)	0.109	(0.028)
H005010	H4	23	1.283	(0.101)	0.709	(0.112)	0.113	(0.016)
H009201	H4	24	0.451	(0.050)	-0.125	(0.089)	0.212	(0.050)
H009301	H4	25	0.804	(0.113)	1.433	(0.263)	0.223	(0.023)
H009401	H4	26	0.646	(0.068)	-0.306	(0.099)	0.254	(0.053)
H009501	H4	27	0.593	(0.081)	0.737	(0.164)	0.242	(0.042)
H009601	H4	28	1.423	(0.143)	1.318	(0.232)	0.187	(0.013)
H009701	H4	29	1.207	(0.095)	-0.533	(0.080)	0.251	(0.038)
H009801	H4	30	1.162	(0.087)	-0.797	(0.089)	0.220	(0.040)
H009901	H4	31	0.994	(0.074)	-1.363	(0.125)	0.194	(0.046)
H010001	H4	32	1.064	(0.088)	-1.058	(0.116)	0.269	(0.050)
H010101	H4	33	1.090	(0.094)	0.415	(0.097)	0.190	(0.024)
H010201	H4	34	0.560	(0.075)	0.372	(0.133)	0.270	(0.050)
H010301	H4	35	0.824	(0.064)	-0.720	(0.085)	0.198	(0.043)
H010401	H4	36	0.925	(0.082)	0.839	(0.120)	0.125	(0.020)
H010501	H4	37	0.847	(0.066)	-0.849	(0.094)	0.211	(0.046)
H010601	H4	38	1.104	(0.117)	0.945	(0.173)	0.232	(0.021)
H010701	H4	39	0.884	(0.115)	1.474	(0.256)	0.183	(0.020)
H010801	H4	40	0.279	(0.041)	0.631	(0.133)	0.235	(0.048)
H010901	H4	41	0.863	(0.079)	0.373	(0.094)	0.195	(0.030)
H011001	H4	42	1.028	(0.081)	-0.321	(0.072)	0.201	(0.036)
H011101	H4	43	0.804	(0.081)	0.827	(0.133)	0.154	(0.026)
H011201	H4	44	0.610	(0.062)	-1.123	(0.144)	0.284	(0.065)
H011301	H4	45	1.046	(0.078)	-0.460	(0.072)	0.192	(0.036)
H011401	H4	46	0.505	(0.087)	1.173	(0.259)	0.250	(0.045)

Table E.30
1986 IRT Parameters, Literature, Grade 11/Age 17

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
L000101	L1	19	0.763	(0.095)	0.423	(0.132)	0.320	(0.038)
L000201	L1	20	0.632	(0.064)	0.165	(0.087)	0.185	(0.040)
L000301	L1	21	0.471	(0.117)	2.701	(0.714)	0.262	(0.029)
L000401	L1	22	0.765	(0.065)	-0.561	(0.084)	0.212	(0.044)
L000501	L1	23	1.063	(0.124)	1.104	(0.202)	0.209	(0.020)
L000601	L1	24	0.373	(0.041)	-1.195	(0.152)	0.223	(0.057)
L000701	L1	25	0.908	(0.083)	0.216	(0.085)	0.205	(0.031)
L000801	L1	26	0.755	(0.087)	0.872	(0.151)	0.192	(0.028)
L000901	L1	27	0.512	(0.094)	1.614	(0.344)	0.256	(0.037)
L001001	L1	28	0.965	(0.099)	0.963	(0.153)	0.145	(0.021)
L001101	L1	29	0.847	(0.115)	1.396	(0.253)	0.221	(0.022
L001201	L1	30	0.652	(0.068)	0.263	(0.093)	0.205	(0.038
L001301	L1	31	0.841	(0.090)	0.498	(0.117)	0.217	(0.032)
L001401	L1	32	1.364	(0.113)	0.094	(0.080)	0.228	(0.025)
L001501	L1	33	0.898	(0.154)	1.369	(0.328)	0.396	(0.024)
L001601	L1	34	0.763	(0.062)	-1.398	(0.134)	0.217	(0.053)
L001701	L1	35	0.347	(0.055)	0.692	(0.163)	0.267	(0.053)
L001801	L1	36	1.152	(0.135)	1.212	(0.225)	0.210	(0.018)
L001901	L1	37	0.353	(0.048)	0.062	(0.102)	0.239	(0.056)
L002001	L1	38	1.776	(0.167)	2.078	(0.361)	0.131	(0.008)
L002101	L1	39	0.985	(0.074)	-0.791	(0.086)	0.193	(0.040)
L002201	L1	40	0.088	(0.023)	10.790	(2.792)	0.091	(0.020)
L002301	L1	41	0.540	(0.083)	1.528	(0.273)	0.179	(0.032)
L002401	L1	42	0.902	(0.090)	-0.021	(0.091)	0.268	(0.039)
L002501	L1	43	0.765	(0.064)	-1.655	(0.159)	0.225	(0.056)
L002601	L1	44	1.085	(0.151)	1.373	(0.286)	0.278	(0.019)
L002701	L1	45	0.901	(0.092)	0.229	(0.100)	0.265	(0.034)
L002801	L1	46	0.561	(0.079)	1.362	(0.230)	0.166	(0.031)
L002901	L1	47	0.644	(0.073)	0.116	(0.099)	0.240	(0.045)
L003001	L1	48	0.942	(0.079)	-0.532	(0.083)	0.227	(0.042)
L003101	L2	19	0.955	(0.080)	-1.271	(0.132)	0.248	(0.054)
L003201	L2	20	1.021	(0.150)	1.366	(0.291)	0.276	(0.020)
L003301	L2	21	0.552	(0.088)	1.245	(0.247)	0.219	(0.038)
L003401	L2	22	0.383	(0.041)	-1.919	(0.219)	0.216	(0.056)
L003501	L2	23	0.931	(0.147)	1.988	(0.397)	0.152	(0.015)
L003601	L2	24	0.531	(0.054)	-0.783	(0.115)	0.243	(0.057)
L003701	L2	25	1.202	(0.164)	1.007	(0.242)	0.368	(0.021)
L003801	L2	26	0.420	(0.062)	1.120	(0.202)	0.186	(0.042)
L003901	L2	27	0.392	(0.052)	0.267	(0.106)	0.224	(0.051)
L004001	L2	28	0.231	(0.062)	4.497	(1.220)	0.269	(0.034)
L004101	L2	29	1.451	(0.112)	-1.162	(0.129)	0.203	(0.041)
L004201	L2	30	0.475	(0.093)	2.002	(0.432)	0.218	(0.034)
L004301	L2	31	0.869	(0.141)	0.957	(0.248)	0.429	(0.029)
L004401	L2	32	0.544	(0.068)	1.113	(0.176)	0.155	(0.032)
L004501	L2	33	0.834	(0.102)	0.816	(0.162)	0.249	(0.029)
L004601	L2	34	1.201	(0.092)	-0.817	(0.092)	0.211	(0.040)
L004701	L2	35	0.618	(0.066)	0.283	(0.095)	0.194	(0.040)
L004801	L2	36	1.094	(0.172)	2.412	(0.504)	0.106	(0.010)
L004901	L2	37	0.773	(0.074)	-0.202	(0.084)	0.237	(0.043)
L005001	L2	38	1.531	(0.228)	2.867	(0.699)	0.142	(0.008)
L005101	L2	39	1.101	(0.094)	-1.883	(0.198)	0.217	(0.053)
L005201	L2	40	0.449	(0.181)	5.616	(2.363)	0.177	(0.011)
L005301	L2	41	0.982	(0.108)	1.297	(0.198)	0.118	(0.017)
L005401	L2	42	1.157	(0.128)	0.842	(0.169)	0.252	(0.021)
L005501	L2	43	1.098	(0.086)	-0.751	(0.089)	0.226	(0.041)
L005601	L2	44	1.217	(0.115)	0.901	(0.149)	0.134	(0.017)
L005701	L2	45	0.671	(0.059)	-0.471	(0.082)	0.196	(0.044)
L005801	L2	46	0.440	(0.113)	2.654	(0.724)	0.281	(0.034)
L005901	L2	47	0.646	(0.067)	-0.224	(0.090)	0.240	(0.048)
L006001	L2	48	0.699	(0.071)	-0.034	(0.087)	0.217	(0.043)
L006101	L2	49	1.196	(0.116)	0.788	(0.143)	0.149	(0.020)
L006201	L3	19	1.423	(0.103)	-1.001	(0.105)	0.176	(0.036)
L006301	L3	20	0.354	(0.057)	1.384	(0.253)	0.192	(0.044)
L006401	L3	21	0.245	(0.071)	5.454	(1.598)	0.192	(0.029)
L006501	L3	22	0.605	(0.054)	-1.097	(0.120)	0.219	(0.054)
L006601	L3	23	0.744	(0.131)	1.974	(0.413)	0.183	(0.021)
L006701	L3	24	0.548	(0.050)	-2.051	(0.201)	0.214	(0.055)
L006801	L3	25	0.771	(0.103)	0.891	(0.183)	0.281	(0.031)
L006901	L3	26	0.654	(0.092)	0.787	(0.174)	0.284	(0.038)
L007001	L3	27	0.434	(0.049)	-0.042	(0.086)	0.203	(0.049)
L007101	L3	28	0.745	(0.121)	1.303	(0.281)	0.325	(0.029)
L007201	L3	29	0.855	(0.079)	-0.567	(0.095)	0.282	(0.048)
L007301	L3	30	1.046	(0.119)	1.221	(0.207)	0.176	(0.018)

BEST COPY AVAILABLE

Table E.30
(continued)

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
L007401	L3	31	0.550	(0.055)	-0.077	(0.080)	0.193	(0.044)
L007501	L3	32	0.852	(0.124)	1.585	(0.296)	0.203	(0.021)
L007601	L3	33	0.354	(0.056)	0.867	(0.182)	0.226	(0.052)
L007701	L3	34	0.733	(0.060)	-1.565	(0.148)	0.216	(0.054)
L007801	L3	35	0.703	(0.078)	0.853	(0.140)	0.164	(0.029)
L007901	L3	36	1.183	(0.172)	2.355	(0.472)	0.144	(0.010)
L008001	L3	37	0.385	(0.045)	0.140	(0.086)	0.189	(0.047)
L008101	L3	38	0.401	(0.046)	-0.402	(0.097)	0.219	(0.054)
L008201	L3	39	0.788	(0.069)	-2.063	(0.200)	0.225	(0.057)
L008301	L3	40	1.613	(0.193)	2.335	(0.477)	0.176	(0.009)
L008401	L3	41	0.517	(0.084)	1.215	(0.247)	0.252	(0.040)
L008501	L3	42	0.887	(0.115)	0.463	(0.149)	0.391	(0.035)
L008601	L3	43	0.986	(0.075)	-0.589	(0.077)	0.193	(0.038)
L008701	L3	44	0.312	(0.045)	0.361	(0.110)	0.227	(0.051)
L008801	L3	45	0.938	(0.086)	-0.151	(0.082)	0.253	(0.039)
L008901	L3	46	0.496	(0.065)	0.588	(0.134)	0.215	(0.045)
L009001	L3	47	0.889	(0.065)	-0.575	(0.072)	0.155	(0.036)
L009101	L3	48	0.747	(0.069)	-0.032	(0.078)	0.202	(0.039)
L009201	L4	19	0.591	(0.051)	-1.240	(0.128)	0.215	(0.053)
L009301	L4	20	0.238	(0.034)	-0.936	(0.157)	0.227	(0.056)
L009401	L4	21	1.064	(0.310)	3.229	(1.226)	0.275	(0.011)
L009501	L4	22	0.360	(0.048)	0.094	(0.100)	0.226	(0.055)
L009601	L4	23	0.596	(0.194)	3.606	(1.259)	0.301	(0.018)
L009701	L4	24	1.156	(0.092)	-1.447	(0.145)	0.224	(0.050)
L009801	L4	25	0.455	(0.076)	1.044	(0.223)	0.246	(0.047)
L009901	L4	26	0.907	(0.093)	0.048	(0.097)	0.311	(0.038)
L010001	L4	27	0.399	(0.045)	-0.181	(0.086)	0.202	(0.050)
L010101	L4	28	0.587	(0.134)	2.368	(0.598)	0.271	(0.026)
L010201	L4	29	0.778	(0.061)	-0.756	(0.088)	0.191	(0.044)
L010301	L4	30	0.141	(0.032)	3.858	(0.878)	0.242	(0.036)
L010401	L4	31	0.693	(0.056)	-0.663	(0.084)	0.185	(0.044)
L010501	L4	32	0.736	(0.087)	0.861	(0.153)	0.210	(0.029)
L010601	L4	33	0.503	(0.050)	-0.282	(0.082)	0.196	(0.047)
L010701	L4	34	0.974	(0.073)	-1.284	(0.118)	0.196	(0.046)
L010801	L4	35	0.920	(0.146)	2.270	(0.440)	0.104	(0.012)
L010901	L4	36	0.981	(0.266)	2.890	(0.992)	0.300	(0.013)
L011001	L4	37	0.764	(0.151)	2.782	(0.621)	0.095	(0.012)
L011101	L4	38	0.474	(0.049)	-0.784	(0.113)	0.228	(0.055)
L011201	L4	39	0.509	(0.051)	-0.698	(0.106)	0.224	(0.054)
L011301	L4	40	1.138	(0.240)	2.824	(0.805)	0.229	(0.011)
L011401	L4	41	0.686	(0.148)	2.653	(0.637)	0.147	(0.018)
L011501	L4	42	1.040	(0.089)	0.065	(0.078)	0.200	(0.031)
L011601	L4	43	0.934	(0.091)	0.011	(0.090)	0.290	(0.036)
L011701	L4	44	0.959	(0.099)	0.669	(0.130)	0.221	(0.026)
L011801	L4	45	1.204	(0.176)	1.110	(0.278)	0.393	(0.021)
L011901	L4	46	1.733	(0.170)	0.949	(0.201)	0.185	(0.015)
L012001	L4	47	0.809	(0.069)	-0.336	(0.076)	0.198	(0.040)
L012101	L4	48	0.944	(0.068)	-0.660	(0.075)	0.159	(0.036)

Table E.31
1986 IRT Parameters, Mathematics Trend Items, Age 9

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N270901	M1	1	0.894	(0.037)	-2.165	(0.098)	0.0	(0.0)
N277401	M1	2	1.026	(0.063)	-1.573	(0.114)	0.177	(0.038)
N267601	M1	3	1.268	(0.066)	-0.611	(0.049)	0.156	(0.020)
N276801	M1	4	0.490	(0.045)	-3.763	(0.353)	0.0	(0.0)
N276802	M1	5	0.725	(0.038)	-1.591	(0.090)	0.0	(0.0)
N276803	M1	6	0.621	(0.035)	0.147	(0.027)	0.0	(0.0)
N250701	M1	7	0.743	(0.044)	-0.850	(0.059)	0.139	(0.022)
N250702	M1	8	1.001	(0.048)	0.841	(0.054)	0.117	(0.011)
N250703	M1	9	1.054	(0.064)	0.015	(0.033)	0.123	(0.016)
N262201	M1	10	0.441	(0.036)	-1.218	(0.105)	0.196	(0.024)
N257201	M1	11	1.233	(0.084)	-0.533	(0.055)	0.283	(0.020)
N276101	M1	12	0.963	(0.040)	-0.758	(0.042)	0.0	(0.0)
N286101	M1	13	0.814	(0.039)	-0.521	(0.035)	0.0	(0.0)
N270001	M1	14	0.448	(0.030)	-0.727	(0.053)	0.0	(0.0)
N272102	M1	15	0.992	(0.062)	0.034	(0.039)	0.173	(0.018)
N284001	M1	16	0.981	(0.050)	-0.383	(0.033)	0.0	(0.0)
N284002	M1	17	0.792	(0.037)	2.054	(0.103)	0.0	(0.0)
N267602	M1	18	1.103	(0.057)	-0.074	(0.031)	0.104	(0.014)
N262501	M1	19	0.269	(0.031)	-0.688	(0.084)	0.227	(0.019)
N262502	M1	20	0.254	(0.062)	6.169	(1.519)	0.172	(0.008)
N265401	M1	21	1.582	(0.164)	2.224	(0.360)	0.340	(0.011)
N266101	M1	22	0.542	(0.052)	1.917	(0.192)	0.264	(0.011)
N269101	M1	23	0.540	(0.071)	2.970	(0.402)	0.238	(0.009)
N268201	M1	24	1.248	(0.058)	1.026	(0.068)	0.201	(0.010)
N252101	M1	25	0.839	(0.060)	1.752	(0.143)	0.170	(0.012)
N272301	M2	1	0.946	(0.052)	-1.947	(0.123)	0.180	(0.040)
N276601	M2	2	1.061	(0.062)	-1.010	(0.076)	0.170	(0.029)
N257801	M2	3	0.588	(0.038)	-0.909	(0.066)	0.240	(0.022)
N263401	M2	4	0.888	(0.063)	-0.701	(0.063)	0.299	(0.022)
N263402	M2	5	1.010	(0.080)	-0.203	(0.043)	0.282	(0.018)
N273501	M2	6	0.744	(0.058)	-0.684	(0.068)	0.261	(0.026)
N275401	M2	7	0.985	(0.043)	-0.478	(0.033)	0.0	(0.0)
N277501	M2	8	0.842	(0.039)	-0.421	(0.031)	0.0	(0.0)
N277601	M2	9	1.438	(0.049)	-0.522	(0.037)	0.0	(0.0)
N277602	M2	10	1.267	(0.053)	0.172	(0.029)	0.0	(0.0)
N277603	M2	11	1.507	(0.063)	-0.011	(0.030)	0.0	(0.0)
N261401	M2	12	0.509	(0.042)	-0.145	(0.037)	0.232	(0.020)
N250601	M2	13	1.097	(0.078)	-0.231	(0.045)	0.212	(0.019)
N250602	M2	14	0.791	(0.053)	-0.584	(0.054)	0.189	(0.023)
N250603	M2	15	1.366	(0.071)	0.566	(0.056)	0.158	(0.013)
N251401	M2	16	0.654	(0.042)	-0.265	(0.038)	0.151	(0.021)
N250901	M2	17	0.599	(0.040)	-0.411	(0.040)	0.178	(0.019)
N250902	M2	18	1.101	(0.051)	1.181	(0.072)	0.157	(0.010)
N250903	M2	19	0.970	(0.051)	0.685	(0.050)	0.109	(0.012)
N276001	M2	21	0.879	(0.037)	-0.975	(0.049)	0.0	(0.0)
N276002	M2	22	0.778	(0.035)	1.507	(0.074)	0.0	(0.0)
N271101	M2	24	0.626	(0.034)	-0.305	(0.028)	0.0	(0.0)
N252001	M2	25	1.244	(0.131)	2.670	(0.372)	0.196	(0.009)
N269001	M2	26	0.565	(0.087)	4.055	(0.634)	0.082	(0.007)
N272801	M3	15	0.576	(0.049)	-2.007	(0.176)	0.180	(0.036)
N267001	M3	16	0.597	(0.045)	-1.392	(0.110)	0.249	(0.026)
N272101	M3	17	0.990	(0.096)	-0.533	(0.071)	0.286	(0.024)
N262401	M3	18	0.594	(0.069)	0.928	(0.116)	0.300	(0.013)
N258501	M3	19	0.876	(0.066)	1.029	(0.092)	0.236	(0.012)

Table E.32
1986 IRT Parameters, Mathematics Trend Items, Age 13

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N281901	M1	15	0.925	(0.040)	-2.181	(0.105)	0.146	(0.034)
N254601	M1	16	1.092	(0.054)	-1.553	(0.089)	0.284	(0.030)
N276801	M1	17	0.433	(0.049)	-4.715	(0.542)	0.0	(0.0)
N276802	M1	18	0.493	(0.044)	-3.957	(0.359)	0.0	(0.0)
N276803	M1	19	0.435	(0.033)	-1.927	(0.148)	0.0	(0.0)
N277601	M1	20	0.856	(0.036)	-2.504	(0.113)	0.0	(0.0)
N277602	M1	21	0.624	(0.030)	-1.885	(0.095)	0.0	(0.0)
N277603	M1	22	0.617	(0.031)	-2.287	(0.117)	0.0	(0.0)
N267201	M1	23	0.776	(0.058)	-1.051	(0.087)	0.254	(0.026)
N286201	M1	24	0.891	(0.051)	-0.892	(0.061)	0.243	(0.021)
N250901	M1	25	0.423	(0.029)	-2.565	(0.176)	0.152	(0.027)
N250902	M1	26	1.020	(0.049)	-0.349	(0.031)	0.075	(0.014)
N250903	M1	27	0.820	(0.039)	-1.510	(0.078)	0.096	(0.025)
N262401	M1	28	0.854	(0.054)	-0.556	(0.048)	0.323	(0.017)
N274801	M1	29	0.629	(0.051)	-0.192	(0.036)	0.269	(0.018)
N265202	M1	30	0.843	(0.074)	-0.176	(0.041)	0.339	(0.018)
N266801	M1	31	0.559	(0.038)	-1.108	(0.080)	0.248	(0.021)
N252901	M1	32	1.249	(0.072)	-0.036	(0.033)	0.109	(0.015)
N262501	M1	33	0.360	(0.033)	-0.237	(0.034)	0.348	(0.015)
N262502	M1	34	1.216	(0.068)	1.974	(0.151)	0.379	(0.008)
N257601	M1	35	1.280	(0.055)	-0.538	(0.035)	0.0	(0.0)
N265201	M1	36	0.810	(0.062)	-1.548	(0.127)	0.339	(0.032)
N273901	M1	37	1.786	(0.111)	0.258	(0.047)	0.184	(0.013)
N258801	M1	38	1.273	(0.055)	1.124	(0.076)	0.397	(0.010)
N263101	M1	39	0.527	(0.027)	-0.291	(0.024)	0.0	(0.0)
N265901	M1	40	0.933	(0.060)	0.930	(0.079)	0.333	(0.012)
N252101	M1	41	0.933	(0.056)	0.623	(0.054)	0.240	(0.013)
N275001	M1	42	0.946	(0.040)	0.363	(0.027)	0.0	(0.0)
N260101	M1	43	1.299	(0.072)	0.415	(0.042)	0.160	(0.011)
N269001	M1	44	1.012	(0.053)	0.382	(0.036)	0.152	(0.011)
N286301	M1	45	1.189	(0.050)	0.660	(0.046)	0.205	(0.010)
N254602	M1	46	0.744	(0.045)	1.413	(0.095)	0.235	(0.009)
N261001	M1	47	0.833	(0.049)	1.011	(0.070)	0.219	(0.010)
N286501	M1	48	1.256	(0.042)	1.161	(0.058)	0.141	(0.008)
N278904	M1	49	1.315	(0.057)	1.487	(0.097)	0.194	(0.010)
N255701	M1	50	1.317	(0.044)	1.268	(0.063)	0.139	(0.008)
N283101	M1	51	1.579	(0.049)	1.554	(0.080)	0.148	(0.006)
N277401	M2	8	0.778	(0.056)	-2.903	(0.220)	0.145	(0.042)
N277901	M2	9	0.591	(0.033)	-3.506	(0.199)	0.0	(0.0)
N277902	M2	10	0.688	(0.036)	-3.301	(0.178)	0.0	(0.0)
N277903	M2	11	0.573	(0.030)	-2.859	(0.154)	0.0	(0.0)
N263401	M2	12	0.675	(0.046)	-2.751	(0.196)	0.257	(0.040)
N263402	M2	13	0.635	(0.045)	-2.478	(0.181)	0.263	(0.036)
N250701	M2	14	0.688	(0.035)	-2.717	(0.143)	0.106	(0.033)
N250702	M2	15	1.145	(0.051)	-0.797	(0.047)	0.102	(0.018)
N250703	M2	16	0.649	(0.031)	-2.110	(0.106)	0.110	(0.028)
N256101	M2	17	0.760	(0.033)	-1.056	(0.052)	0.0	(0.0)
N262201	M2	18	0.520	(0.037)	-1.789	(0.132)	0.361	(0.023)
N270301	M2	20	0.421	(0.031)	-1.596	(0.119)	0.126	(0.022)
N270302	M2	21	1.018	(0.047)	2.194	(0.118)	0.051	(0.005)
N253701	M2	22	0.361	(0.031)	-0.504	(0.050)	0.271	(0.016)
N286601	M2	23	1.698	(0.059)	-0.194	(0.029)	0.0	(0.0)
N286602	M2	24	1.363	(0.051)	-0.247	(0.027)	0.0	(0.0)
N286603	M2	25	1.494	(0.050)	0.405	(0.030)	0.0	(0.0)
N269101	M2	26	0.752	(0.048)	-0.384	(0.037)	0.213	(0.016)
N282201	M2	28	1.063	(0.058)	0.576	(0.051)	0.343	(0.011)
N278902	M2	29	0.720	(0.051)	1.338	(0.107)	0.216	(0.012)
N263501	M2	30	1.389	(0.092)	0.187	(0.036)	0.115	(0.012)
N258802	M2	31	1.619	(0.078)	0.484	(0.051)	0.254	(0.011)
N278901	M2	32	1.559	(0.086)	0.415	(0.051)	0.212	(0.013)
N264701	M2	33	1.175	(0.056)	0.867	(0.059)	0.206	(0.010)
N261501	M2	34	0.661	(0.056)	-0.545	(0.055)	0.141	(0.020)
N261801	M2	35	0.679	(0.053)	0.044	(0.033)	0.223	(0.017)
N261601	M2	36	0.344	(0.043)	1.903	(0.239)	0.155	(0.012)
N261301	M2	37	0.700	(0.048)	0.768	(0.062)	0.113	(0.012)
N261201	M2	38	0.525	(0.052)	1.619	(0.166)	0.219	(0.012)
N281401	M2	39	0.728	(0.050)	1.711	(0.127)	0.106	(0.009)
N252001	M2	40	1.423	(0.064)	0.832	(0.062)	0.179	(0.010)
N258803	M2	41	1.191	(0.044)	1.351	(0.068)	0.170	(0.007)
N278903	M2	42	1.338	(0.058)	1.066	(0.073)	0.169	(0.010)
N286502	M2	43	1.671	(0.054)	1.171	(0.068)	0.160	(0.008)
N275301	M3	25	0.372	(0.028)	-1.728	(0.132)	0.147	(0.022)
N282202	M3	26	0.936	(0.066)	-0.458	(0.045)	0.255	(0.017)

Table E.32
(continued)

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N266101	M3	27	0.849	(0.065)	-0.161	(0.033)	0.292	(0.014)
N254001	M3	28	1.161	(0.084)	-0.479	(0.047)	0.118	(0.017)
N269901	M3	29	0.664	(0.049)	-0.274	(0.035)	0.288	(0.015)
N256501	M3	30	0.866	(0.069)	0.581	(0.061)	0.318	(0.012)
N265902	M3	31	1.077	(0.073)	1.170	(0.103)	0.328	(0.011)
N256801	M3	32	1.051	(0.069)	0.841	(0.072)	0.312	(0.011)

Table E.33
1986 IRT Parameters, Mathematics Trend Items, Age 17

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N256101	M1	15	1.011	(0.035)	-1.769	(0.071)	0.0	(0.0)
N260601	M1	16	1.295	(0.035)	-1.305	(0.049)	0.0	(0.0)
N262401	M1	17	0.832	(0.040)	-1.129	(0.063)	0.244	(0.023)
N258804	M1	18	0.524	(0.038)	-1.545	(0.115)	0.282	(0.024)
N286001	M1	19	0.827	(0.043)	-0.908	(0.055)	0.187	(0.021)
N286002	M1	20	1.370	(0.048)	-1.234	(0.060)	0.151	(0.027)
N286302	M1	22	1.474	(0.071)	-0.297	(0.042)	0.300	(0.016)
N278501	M1	23	1.405	(0.042)	-0.803	(0.038)	0.0	(0.0)
N278502	M1	24	1.364	(0.050)	-0.464	(0.032)	0.0	(0.0)
N278503	M1	25	1.252	(0.039)	-0.755	(0.036)	0.0	(0.0)
N258802	M1	26	1.429	(0.087)	-0.343	(0.043)	0.278	(0.016)
N254602	M1	27	1.607	(0.087)	-0.365	(0.042)	0.214	(0.016)
N259901	M1	28	0.943	(0.050)	-0.568	(0.043)	0.218	(0.018)
N287101	M1	29	1.956	(0.101)	-0.319	(0.043)	0.218	(0.014)
N270301	M1	30	0.987	(0.041)	-1.293	(0.064)	0.178	(0.026)
N270302	M1	31	1.865	(0.093)	0.262	(0.040)	0.093	(0.010)
N255701	M1	32	1.393	(0.090)	-0.381	(0.044)	0.201	(0.017)
N254301	M1	33	1.100	(0.065)	0.007	(0.033)	0.267	(0.013)
N286502	M1	34	2.315	(0.106)	-0.185	(0.039)	0.079	(0.011)
N260901	M1	35	1.622	(0.096)	-0.066	(0.034)	0.148	(0.013)
N256801	M1	36	1.059	(0.062)	-0.389	(0.040)	0.242	(0.017)
N258803	M1	37	1.231	(0.057)	0.468	(0.042)	0.221	(0.010)
N262601	M1	38	0.723	(0.048)	0.452	(0.043)	0.220	(0.012)
N253901	M1	39	1.643	(0.110)	-0.110	(0.041)	0.256	(0.014)
N253902	M1	40	0.650	(0.047)	0.527	(0.053)	0.374	(0.013)
N253903	M1	41	1.226	(0.061)	0.608	(0.053)	0.297	(0.011)
N253904	M1	42	1.725	(0.088)	0.461	(0.056)	0.324	(0.011)
N263001	M1	43	0.574	(0.028)	0.367	(0.027)	0.0	(0.0)
N278905	M1	44	1.116	(0.056)	1.169	(0.084)	0.247	(0.011)
N287301	M1	45	0.738	(0.030)	-0.363	(0.025)	0.0	(0.0)
N287302	M1	46	0.700	(0.029)	1.442	(0.065)	0.0	(0.0)
N264301	M1	47	0.671	(0.029)	1.008	(0.049)	0.0	(0.0)
N282801	M1	48	1.762	(0.057)	1.427	(0.086)	0.168	(0.008)
N251101	M1	49	1.132	(0.036)	1.268	(0.051)	0.0	(0.0)
N254601	M2	15	1.170	(0.045)	-2.100	(0.100)	0.242	(0.042)
N262301	M2	17	0.465	(0.037)	-1.753	(0.141)	0.268	(0.025)
N263201	M2	18	1.037	(0.052)	-1.051	(0.066)	0.358	(0.022)
N263202	M2	19	1.199	(0.090)	-0.231	(0.044)	0.435	(0.014)
N260101	M2	20	1.418	(0.054)	-0.857	(0.049)	0.180	(0.021)
N254001	M2	21	0.961	(0.044)	-0.786	(0.046)	0.188	(0.019)
N269001	M2	22	0.903	(0.079)	-0.271	(0.043)	0.420	(0.009)
N278901	M2	23	0.961	(0.065)	-0.609	(0.057)	0.293	(0.022)
N261501	M2	24	0.941	(0.050)	-1.360	(0.083)	0.189	(0.030)
N261801	M2	25	0.590	(0.045)	-1.011	(0.085)	0.234	(0.024)
N261201	M2	26	0.579	(0.046)	0.159	(0.035)	0.205	(0.016)
N261601	M2	27	0.456	(0.043)	1.128	(0.114)	0.219	(0.013)
N261301	M2	28	0.662	(0.047)	0.530	(0.051)	0.167	(0.014)
N281401	M2	29	0.680	(0.046)	1.303	(0.099)	0.176	(0.011)
N280401	M2	30	0.638	(0.028)	-1.099	(0.053)	0.0	(0.0)
N259001	M2	31	0.804	(0.031)	-0.725	(0.036)	0.0	(0.0)
N287102	M2	32	1.992	(0.088)	-0.493	(0.046)	0.209	(0.016)
N286301	M2	33	1.468	(0.045)	-0.431	(0.033)	0.123	(0.014)
N286501	M2	34	2.287	(0.081)	-0.380	(0.043)	0.136	(0.013)
N262501	M2	35	0.449	(0.037)	-0.340	(0.040)	0.373	(0.015)
N262502	M2	36	1.071	(0.063)	1.342	(0.105)	0.462	(0.009)
N263101	M2	37	0.671	(0.030)	-0.710	(0.039)	0.0	(0.0)
N258801	M2	38	0.991	(0.058)	-0.207	(0.034)	0.264	(0.015)
N264701	M2	39	1.396	(0.069)	-0.259	(0.037)	0.216	(0.015)
N261001	M2	40	0.741	(0.045)	-0.322	(0.033)	0.213	(0.016)
N251701	M2	41	1.168	(0.067)	0.042	(0.039)	0.186	(0.016)
N278902	M2	42	1.286	(0.096)	0.148	(0.048)	0.286	(0.015)
N260801	M2	43	1.453	(0.061)	0.148	(0.027)	0.0	(0.0)
N278903	M2	44	1.287	(0.082)	0.138	(0.043)	0.196	(0.015)
N255601	M2	45	0.896	(0.057)	1.867	(0.141)	0.366	(0.010)
N255301	M2	46	1.375	(0.054)	1.594	(0.096)	0.259	(0.008)
N268901	M2	47	2.090	(0.073)	0.679	(0.058)	0.175	(0.009)
N268801	M2	48	1.447	(0.046)	1.292	(0.065)	0.097	(0.007)
N255801	M2	49	0.870	(0.030)	1.800	(0.070)	0.0	(0.0)
N266501	M3	31	0.678	(0.051)	-0.532	(0.049)	0.248	(0.018)
N271301	M3	32	1.416	(0.116)	0.349	(0.056)	0.290	(0.012)
N255501	M3	33	0.842	(0.067)	0.436	(0.052)	0.316	(0.013)
N256001	M3	34	0.836	(0.050)	0.106	(0.024)	0.0	(0.0)
N257101	M3	35	0.438	(0.058)	2.771	(0.372)	0.298	(0.010)

Table E.34
1986 IRT Parameters, Science Trend Items, Age 9

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N400001	S1	6	0.899	(0.093)	-0.793	(0.118)	0.218	(0.053)
N400301	S1	8	0.725	(0.099)	-0.093	(0.121)	0.323	(0.052)
N400401	S1	9	0.899	(0.121)	-1.400	(0.229)	0.468	(0.067)
N400402	S1	10	1.592	(0.177)	-0.594	(0.122)	0.353	(0.043)
N400403	S1	11	0.508	(0.084)	-2.237	(0.388)	0.470	(0.071)
N400404	S1	12	1.162	(0.134)	-0.430	(0.112)	0.355	(0.045)
N400405	S1	13	0.818	(0.109)	-0.843	(0.163)	0.440	(0.061)
N400501	S1	14	0.530	(0.095)	0.558	(0.188)	0.334	(0.054)
N400101	S1	15	0.589	(0.193)	2.037	(0.767)	0.531	(0.033)
N400102	S1	16	0.849	(0.202)	1.392	(0.456)	0.455	(0.030)
N400601	S1	17	0.620	(0.075)	-0.094	(0.098)	0.197	(0.050)
N400701	S1	18	0.630	(0.066)	0.068	(0.088)	0.184	(0.042)
N400901	S1	19	0.228	(0.048)	2.692	(0.581)	0.210	(0.041)
N401001	S1	20	0.474	(0.063)	0.648	(0.137)	0.181	(0.044)
N401101	S1	21	0.270	(0.063)	1.807	(0.449)	0.227	(0.056)
N401201	S1	22	0.750	(0.238)	2.672	(0.972)	0.278	(0.022)
N401301	S1	23	0.527	(0.117)	1.634	(0.416)	0.220	(0.041)
N401501	S2	1	0.288	(0.056)	-0.529	(0.162)	0.349	(0.068)
N401601	S2	2	0.596	(0.064)	-1.008	(0.131)	0.172	(0.051)
N401702	S2	4	0.374	(0.096)	0.845	(0.308)	0.508	(0.059)
N401703	S2	5	0.323	(0.086)	1.157	(0.376)	0.488	(0.059)
N401801	S2	6	0.742	(0.120)	-0.028	(0.150)	0.437	(0.053)
N401802	S2	7	0.646	(0.101)	-0.650	(0.172)	0.472	(0.064)
N401803	S2	8	0.493	(0.094)	-0.020	(0.165)	0.461	(0.062)
N401804	S2	9	0.472	(0.114)	1.097	(0.344)	0.439	(0.052)
N401901	S2	10	0.506	(0.125)	1.381	(0.412)	0.363	(0.049)
N402001	S2	11	1.034	(0.132)	-0.747	(0.148)	0.429	(0.056)
N402002	S2	12	1.015	(0.130)	-0.994	(0.173)	0.438	(0.060)
N402005	S2	15	0.906	(0.125)	-0.397	(0.136)	0.430	(0.053)
N402101	S2	16	0.482	(0.063)	0.307	(0.112)	0.192	(0.050)
N402201	S2	17	0.357	(0.058)	0.317	(0.120)	0.204	(0.055)
N402401	S2	18	0.198	(0.044)	3.003	(0.680)	0.218	(0.041)
N402501	S2	19	0.372	(0.116)	3.363	(1.085)	0.221	(0.036)
N402602	S2	21	0.393	(0.073)	-0.971	(0.228)	0.474	(0.069)
N402701	S2	23	0.522	(0.120)	1.954	(0.498)	0.196	(0.037)
N402801	S2	24	0.582	(0.189)	3.145	(1.091)	0.180	(0.023)
N402901	S2	25	0.405	(0.144)	4.516	(1.645)	0.168	(0.023)
N403001	S3	12	0.671	(0.096)	-2.884	(0.431)	0.201	(0.057)
N403101	S3	13	0.639	(0.088)	-2.688	(0.386)	0.204	(0.058)
N403201	S3	14	0.688	(0.077)	-2.008	(0.243)	0.182	(0.054)
N403202	S3	15	0.450	(0.055)	-1.124	(0.159)	0.195	(0.055)
N403301	S3	16	0.700	(0.075)	-0.767	(0.116)	0.200	(0.053)
N403401	S3	17	0.412	(0.082)	0.688	(0.210)	0.332	(0.058)
N403501	S3	18	0.722	(0.130)	0.400	(0.188)	0.426	(0.048)
N403502	S3	19	0.678	(0.094)	-1.627	(0.255)	0.441	(0.067)
N403503	S3	20	0.476	(0.089)	-0.025	(0.158)	0.447	(0.062)
N403601	S3	21	0.676	(0.103)	0.562	(0.161)	0.262	(0.043)
N403701	S3	22	2.672	(0.286)	-0.178	(0.097)	0.390	(0.025)
N403702	S3	23	2.116	(0.205)	-0.376	(0.094)	0.339	(0.030)
N403703	S3	24	2.121	(0.204)	-0.196	(0.087)	0.337	(0.027)
N403801	S3	25	0.442	(0.128)	1.599	(0.534)	0.486	(0.048)
N403803	S3	27	0.540	(0.085)	-0.660	(0.167)	0.440	(0.065)
N403804	S3	28	0.657	(0.100)	-0.352	(0.144)	0.428	(0.059)
N403901	S3	29	0.760	(0.072)	-0.245	(0.083)	0.195	(0.043)
N404001	S3	30	0.257	(0.043)	1.084	(0.206)	0.179	(0.048)
N404201	S3	31	0.379	(0.076)	1.464	(0.331)	0.187	(0.049)

Table E.35
1986 IRT Parameters, Science Trend Items, Age 13

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N404501	S1	12	1.348	(0.039)	-2.091	(0.082)	0.182	(0.037)
N404601	S1	13	0.420	(0.023)	-1.199	(0.069)	0.270	(0.013)
N404701	S1	14	0.684	(0.034)	-1.687	(0.090)	0.216	(0.025)
N404702	S1	15	0.592	(0.046)	-0.304	(0.037)	0.231	(0.015)
N400201	S1	16	0.425	(0.024)	-1.954	(0.114)	0.229	(0.016)
N404901	S1	17	0.868	(0.039)	-0.955	(0.050)	0.231	(0.017)
N404801	S1	20	1.058	(0.053)	-2.193	(0.130)	0.405	(0.041)
N404802	S1	21	1.720	(0.076)	-0.839	(0.065)	0.349	(0.019)
N404803	S1	22	1.127	(0.100)	-0.273	(0.046)	0.335	(0.014)
N405001	S1	23	0.388	(0.021)	-0.045	(0.015)	0.205	(0.009)
N405101	S1	24	0.783	(0.029)	0.350	(0.022)	0.216	(0.007)
N405201	S1	25	0.374	(0.021)	-0.205	(0.019)	0.223	(0.010)
N405301	S1	26	0.929	(0.105)	0.582	(0.078)	0.243	(0.010)
N405401	S1	27	0.769	(0.029)	0.821	(0.038)	0.166	(0.007)
N401201	S1	28	0.707	(0.030)	0.014	(0.019)	0.242	(0.009)
N405501	S1	29	0.497	(0.027)	0.813	(0.048)	0.208	(0.008)
N405601	S1	30	0.215	(0.038)	1.799	(0.320)	0.224	(0.012)
N405701	S1	31	1.243	(0.129)	0.290	(0.050)	0.183	(0.011)
N405801	S1	32	0.711	(0.083)	1.022	(0.126)	0.163	(0.009)
N405901	S1	33	0.878	(0.037)	1.189	(0.059)	0.221	(0.007)
N406001	S1	34	0.926	(0.039)	2.078	(0.100)	0.226	(0.005)
N406101	S1	35	0.689	(0.029)	2.085	(0.094)	0.185	(0.005)
N406201	S1	36	1.129	(0.033)	2.082	(0.077)	0.133	(0.004)
N406301	S2	10	0.237	(0.023)	-3.920	(0.386)	0.432	(0.016)
N406302	S2	11	0.435	(0.027)	-0.015	(0.021)	0.434	(0.009)
N406303	S2	12	0.600	(0.030)	0.360	(0.028)	0.393	(0.008)
N406304	S2	13	0.460	(0.027)	-0.043	(0.020)	0.377	(0.009)
N406401	S2	14	0.486	(0.031)	-0.236	(0.026)	0.471	(0.009)
N406402	S2	15	0.624	(0.030)	-0.369	(0.027)	0.339	(0.011)
N406403	S2	16	0.722	(0.032)	-1.552	(0.074)	0.411	(0.017)
N406404	S2	17	0.966	(0.047)	-0.481	(0.034)	0.426	(0.011)
N406405	S2	18	0.613	(0.031)	-1.014	(0.056)	0.387	(0.014)
N406501	S2	19	0.670	(0.045)	-0.317	(0.032)	0.203	(0.013)
N406601	S2	20	0.376	(0.021)	-1.155	(0.066)	0.202	(0.012)
N406701	S2	21	0.583	(0.036)	-0.492	(0.038)	0.223	(0.013)
N406801	S2	22	0.928	(0.033)	-1.612	(0.065)	0.357	(0.020)
N406802	S2	23	0.474	(0.057)	3.024	(0.367)	0.548	(0.005)
N406803	S2	24	0.835	(0.031)	-1.080	(0.046)	0.315	(0.014)
N406804	S2	25	0.726	(0.028)	-1.292	(0.055)	0.300	(0.015)
N406805	S2	26	1.259	(0.059)	1.575	(0.106)	0.611	(0.005)
N406806	S2	27	0.326	(0.023)	-0.114	(0.020)	0.349	(0.010)
N406901	S2	28	0.526	(0.024)	-0.296	(0.021)	0.201	(0.010)
N407001	S2	29	0.280	(0.021)	-0.069	(0.017)	0.206	(0.010)
N407101	S2	30	0.998	(0.032)	1.561	(0.062)	0.140	(0.006)
N407201	S2	31	0.414	(0.025)	0.556	(0.037)	0.229	(0.008)
N407301	S2	32	0.316	(0.027)	1.903	(0.165)	0.259	(0.008)
N407302	S2	33	0.271	(0.026)	1.448	(0.143)	0.277	(0.009)
N408001	S2	34	0.991	(0.112)	0.474	(0.064)	0.237	(0.008)
N407601	S2	35	0.712	(0.101)	0.697	(0.106)	0.198	(0.011)
N407701	S2	37	0.456	(0.023)	0.642	(0.037)	0.164	(0.008)
N407801	S2	38	0.707	(0.038)	1.721	(0.098)	0.241	(0.006)
N407901	S2	39	0.428	(0.039)	0.386	(0.043)	0.190	(0.011)
N408201	S2	40	0.544	(0.090)	2.959	(0.502)	0.218	(0.008)
N408301	S3	10	1.401	(0.047)	0.235	(0.026)	0.290	(0.007)
N408302	S3	11	0.763	(0.030)	-1.618	(0.068)	0.351	(0.019)
N408303	S3	12	0.865	(0.034)	-1.368	(0.060)	0.421	(0.016)
N408304	S3	13	1.044	(0.038)	-1.270	(0.055)	0.415	(0.017)
N408401	S3	14	0.294	(0.036)	-1.361	(0.166)	0.238	(0.019)
N408501	S3	15	0.899	(0.039)	-0.916	(0.045)	0.251	(0.015)
N408502	S3	16	0.756	(0.037)	0.389	(0.027)	0.150	(0.008)
N408601	S3	17	0.602	(0.022)	-0.628	(0.028)	0.185	(0.011)
N408701	S3	18	0.391	(0.030)	-0.088	(0.020)	0.244	(0.011)
N408801	S3	19	0.418	(0.024)	0.077	(0.017)	0.291	(0.009)
N408901	S3	20	1.172	(0.059)	-0.422	(0.036)	0.494	(0.011)
N408902	S3	21	1.118	(0.040)	-1.646	(0.071)	0.442	(0.023)
N408903	S3	22	0.809	(0.034)	-0.160	(0.022)	0.357	(0.010)
N408904	S3	23	0.652	(0.030)	0.319	(0.027)	0.435	(0.008)
N409001	S3	24	0.967	(0.058)	-0.420	(0.039)	0.168	(0.015)
N409101	S3	25	0.646	(0.026)	-0.974	(0.043)	0.213	(0.014)
N409102	S3	26	0.556	(0.026)	-0.178	(0.019)	0.215	(0.010)
N409103	S3	27	0.224	(0.030)	3.708	(0.494)	0.274	(0.006)
N409201	S3	28	0.667	(0.041)	0.048	(0.022)	0.347	(0.009)
N409301	S3	29	1.027	(0.039)	-0.217	(0.021)	0.162	(0.010)

Table E.35
(continued)

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N409501	S3	33	0.923	(0.027)	1.590	(0.056)	0.138	(0.005)
N409601	S3	34	1.157	(0.158)	0.762	(0.120)	0.282	(0.010)
N409701	S3	35	0.878	(0.041)	1.230	(0.066)	0.255	(0.007)

Table E.36
1986 IRT Parameters, Science Trend Items, Age 17

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N400201	S1	12	0.425	(0.024)	-1.954	(0.114)	0.229	(0.016)
N404601	S1	13	0.420	(0.023)	-1.199	(0.069)	0.270	(0.013)
N410003	S1	16	0.386	(0.060)	-3.255	(0.505)	0.413	(0.035)
N410004	S1	17	0.515	(0.057)	-1.290	(0.148)	0.419	(0.025)
N409901	S1	18	0.716	(0.058)	-0.678	(0.064)	0.228	(0.024)
N408601	S1	19	0.602	(0.022)	-0.628	(0.028)	0.185	(0.011)
N409301	S1	20	1.027	(0.039)	-0.217	(0.021)	0.162	(0.010)
N406301	S1	21	0.237	(0.023)	-3.920	(0.386)	0.432	(0.016)
N406302	S1	22	0.435	(0.027)	-0.015	(0.021)	0.434	(0.009)
N406303	S1	23	0.600	(0.030)	0.360	(0.028)	0.393	(0.008)
N406304	S1	24	0.460	(0.027)	-0.043	(0.020)	0.377	(0.009)
N410101	S1	25	0.713	(0.076)	-0.583	(0.074)	0.427	(0.022)
N410102	S1	26	0.279	(0.036)	-1.015	(0.135)	0.425	(0.019)
N410103	S1	27	0.429	(0.047)	-1.569	(0.177)	0.408	(0.025)
N406601	S1	28	0.376	(0.021)	-1.155	(0.066)	0.202	(0.012)
N405001	S1	29	0.388	(0.021)	-0.045	(0.015)	0.205	(0.009)
N401201	S1	30	0.707	(0.030)	0.014	(0.019)	0.242	(0.009)
N405201	S1	31	0.374	(0.021)	-0.205	(0.019)	0.223	(0.010)
N410201	S1	32	0.763	(0.036)	1.638	(0.088)	0.226	(0.011)
N406001	S1	33	0.926	(0.039)	2.078	(0.100)	0.226	(0.005)
N409501	S1	34	0.923	(0.027)	1.590	(0.056)	0.138	(0.005)
N406101	S1	35	0.689	(0.029)	2.085	(0.094)	0.185	(0.005)
N406201	S1	37	1.129	(0.033)	2.082	(0.077)	0.133	(0.004)
N408101	S1	38	1.052	(0.049)	2.229	(0.126)	0.202	(0.006)
N406401	S2	10	0.486	(0.031)	-0.236	(0.026)	0.471	(0.009)
N406402	S2	11	0.624	(0.030)	-0.369	(0.027)	0.339	(0.011)
N406403	S2	12	0.722	(0.032)	-1.552	(0.074)	0.411	(0.017)
N406404	S2	13	0.966	(0.047)	-0.481	(0.034)	0.426	(0.011)
N406405	S2	14	0.613	(0.031)	-1.014	(0.056)	0.387	(0.014)
N410401	S2	15	0.265	(0.026)	-0.362	(0.041)	0.270	(0.015)
N406801	S2	16	0.928	(0.033)	-1.612	(0.065)	0.357	(0.020)
N406802	S2	17	0.474	(0.057)	3.024	(0.367)	0.548	(0.005)
N406803	S2	18	0.835	(0.031)	-1.080	(0.046)	0.315	(0.014)
N406804	S2	19	0.726	(0.028)	-1.292	(0.055)	0.300	(0.015)
N406805	S2	20	1.259	(0.059)	1.575	(0.106)	0.611	(0.005)
N406806	S2	21	0.326	(0.023)	-0.114	(0.020)	0.349	(0.010)
N410501	S2	22	0.264	(0.023)	-0.635	(0.059)	0.190	(0.016)
N410601	S2	23	1.457	(0.038)	1.680	(0.071)	0.164	(0.008)
N410602	S2	24	0.543	(0.059)	-2.006	(0.224)	0.412	(0.032)
N410603	S2	25	1.146	(0.045)	1.023	(0.061)	0.361	(0.011)
N410604	S2	26	0.456	(0.049)	-1.955	(0.214)	0.407	(0.029)
N406901	S2	27	0.526	(0.024)	-0.296	(0.021)	0.201	(0.010)
N407401	S2	28	0.532	(0.041)	-0.249	(0.036)	0.391	(0.017)
N407403	S2	30	0.561	(0.049)	-0.282	(0.041)	0.416	(0.018)
N407404	S2	31	0.495	(0.062)	-1.051	(0.136)	0.418	(0.023)
N407201	S2	32	0.414	(0.025)	0.556	(0.037)	0.229	(0.008)
N407001	S2	33	0.280	(0.021)	-0.069	(0.017)	0.206	(0.010)
N410701	S2	34	0.858	(0.034)	1.143	(0.058)	0.218	(0.012)
N407701	S2	35	0.456	(0.023)	0.642	(0.037)	0.164	(0.008)
N407301	S2	36	0.316	(0.027)	1.903	(0.165)	0.259	(0.008)
N407302	S2	37	0.271	(0.026)	1.448	(0.143)	0.277	(0.009)
N407101	S2	38	0.998	(0.032)	1.561	(0.062)	0.140	(0.006)
N410801	S2	39	0.547	(0.036)	2.268	(0.155)	0.227	(0.010)
N410901	S2	40	1.214	(0.036)	1.530	(0.064)	0.122	(0.009)
N411001	S2	41	0.990	(0.041)	2.277	(0.113)	0.142	(0.007)
N408301	S3	10	1.401	(0.047)	0.235	(0.026)	0.290	(0.007)
N408302	S3	11	0.763	(0.030)	-1.618	(0.068)	0.351	(0.019)
N408303	S3	12	0.865	(0.034)	-1.368	(0.060)	0.421	(0.016)
N408304	S3	13	1.044	(0.038)	-1.270	(0.055)	0.415	(0.017)
N405101	S3	14	0.783	(0.029)	0.350	(0.022)	0.216	(0.007)
N408901	S3	15	1.172	(0.059)	-0.422	(0.036)	0.494	(0.011)
N408902	S3	16	1.118	(0.040)	-1.646	(0.071)	0.442	(0.023)
N408903	S3	17	0.809	(0.034)	-0.160	(0.022)	0.357	(0.010)
N408904	S3	18	0.652	(0.030)	0.319	(0.027)	0.435	(0.008)
N405401	S3	19	0.769	(0.029)	0.821	(0.038)	0.166	(0.007)
N411301	S3	20	0.613	(0.070)	4.181	(0.493)	0.142	(0.007)
N405501	S3	21	0.497	(0.027)	0.813	(0.048)	0.208	(0.008)
N411101	S3	22	0.629	(0.030)	0.801	(0.049)	0.190	(0.015)
N411201	S3	23	0.768	(0.033)	0.822	(0.047)	0.214	(0.014)
N408801	S3	24	0.418	(0.024)	0.077	(0.017)	0.291	(0.009)
N411401	S3	25	1.780	(0.049)	1.201	(0.066)	0.216	(0.011)
N411501	S3	26	1.145	(0.032)	1.800	(0.070)	0.179	(0.009)
N411502	S3	27	0.700	(0.059)	-0.604	(0.063)	0.255	(0.026)

BEST COPY AVAILABLE

Table E.36
(continued)

FIELD	BLOCK	ITEM	A	SE	B	SE	C	SE
N411601	S3	28	1.294	(0.040)	1.652	(0.076)	0.225	(0.010)
N411701	S3	29	0.885	(0.034)	1.850	(0.085)	0.194	(0.010)
N411801	S3	30	1.782	(0.048)	1.146	(0.062)	0.192	(0.011)
N411901	S3	31	1.078	(0.035)	1.859	(0.079)	0.202	(0.009)
N412001	S3	32	0.747	(0.046)	2.543	(0.175)	0.303	(0.010)

APPENDIX F

U.S. History and Literature Items

Table F.1

History and Literature Derived Variables

YRSHIST (Years of History and Related Courses)

Items H800201 to H800205 asked students to indicate the number of years that they had studied a particular history or history-related course. Each of the five items was recoded as follows:

Studied 1 school year = 1.0
Studied 1/2 school year = .5
Studied less that 1/2 school year = .25
Have not studied = 0

The sum of the five recoded variables was then assigned the codes:

0 to 1 years = 1
More than 1 to 2 years = 2
More than 2 to 3 years = 3
More than 3 years = 4

NHIST (Number of Topics Studied)

Items H800301 to H800306 asked students if they had taken various topics since 9th grade. The sum of the number of topics taken was computed and recoded as follows:

0 - 2 topics studied = 1
3 topics studied = 2
4 topics studied = 3
5 topics studied = 4
6 topics studied = 5

NHIST2 (Number of Topics Studied)

This variable was created from the same as items used for NHIST, but were recoded as:

0 - 2 topics studied = 1
3 - 4 topics studied = 2
5 - 6 topics studied = 3

Table F.1 (continued)

HISLEN (How Long Since You Took a U.S. History Course)

Item H800101 was recoded as:

Taking one now = 1
1-2, 3-4 years ago = 2 (1-4 years ago)
Haven't taken one = 3

USHIS1 to USHIS6 (How Often Do Things in U.S. History Course)

Responses to items H800401 to H800406 were collapsed as follows:

Once a week, once a month, several times a year = 1 (ever)
Hardly ever or never = 2 (never)

HIS1 to HIS7 (How Often Do Things in History Course)

Responses to items H800501 to H800507 were collapsed as follows:

Every day, 2-3 times a week, once a week, < once a week = 1 (ever)
Never = 2 (never)

NWKSCH (Number of Works Read for School)

Items L800601 to L800607 asked students to indicate the number of works they had read for school during the first half of the school year. First, responses to each of the seven items were recoded as follows:

None = 0
1-2 = 1.5
3-4 = 3.5
5-6 = 5.5
More than 6 = 7.5

The sum of the seven recoded variables was then assigned the values:

5 or less = 1
6 to 10 = 2
11 to 15 = 3
16 to 20 = 4
21 to 25 = 5
Greater than 25 = 6

Table F.1 (continued)

NWKOWN (Number of Works Read on Your Own)

Items L800701 to L800705 asked students to indicate the number of works they had read on their own during the first half of the school year. The five values were recoded in the same way as were the component variables used in NWKSCH. The sum of these five recoded variables was then assigned the values:

5 or less = 1
6 to 10 = 2
11 to 15 = 3
Greater than 15 = 4

FRQPRAL (Frequency of Classroom Practices)

Items L801201 to L801209 asked students to indicate if their English teacher practiced various activities. The sum of the number of practices conducted is assigned the values:

Low (0-5 practices) = 1
Medium (6 or 7 practices) = 2
High (8 or 9 practices) = 3

NBOOKS (Number of Books Read on Own or for School)

Items L801401 to L801410 asked students to indicate whether they had read specific books either for school, on their own, or not at all. The sum of the number of books that the student had read on his or her own or read for school was assigned the values:

0 - 1 books = 1
2 - 3 books = 2
4 books = 3
5 books = 4
6 or more books = 5

Table F.1 (continued)

NBKSCH (Number of Books Read for School)

Items L801401 to L801410 asked students to indicate whether they had read specific books either for school, on their own, or not at all. The sum of the number of books that the student had read for school was assigned the values:

0 books = 1
1 book = 2
2 books = 3
3 books = 4
4 or more books = 5

PERLIT (In English Class, Percentage of Time Spent on Literature)

Item L800101 was recoded as follows:

< 25%, about 25% = 1 (25% or less)
About 50% = 2 (50%)
About 75%, > 75% = 3 (75% or more)

WRITLIT (Does Your English teacher: Plot and Analyses)

Responses to item L801207 (Does your English teacher ask you to write summaries [plot]) and item L801208 (Does your English teacher ask you to write analyses) were combined as follows:

Plot - no , analysis - no = 1
Plot - yes, analysis - no = 2
Plot - no , analysis - yes = 3
Plot - yes, analysis - no = 4

Table F.2

NAEP ID Numbers for Items Used in Mean Percents Correct in Literature and U.S. History

Women's History

H005801
H002501
H009401
H005301
H002101
H006901
H007301
H006401

Black History

H002601
H002701
H003101
H003401
H004301
H005801
H006001
H006101
H007401
H009201
H009601
H010601
H010801
H001601

Documents

H000201
H000901
H001701
H001801
H002801
H003501
H006301
H006501
H006801
H008101
H009101
H010201
H011201

Other Social Trends & Movements

H000701
H001301
H001401
H001501
H002301
H003201
H005701
H007201
H007301
H008601
H009301
H009501
H010101
H009901
H005501
H007801
H001001
H004001
H007901

People

H000801
H001101
H001601
H002001
H002901
H003001
H004301
H004601
H004701
H005801
H006201
H006401
H006601
H006901
H007501
H007601
H008501
H008701
H009401
H009701
H010801
H010901
H011101

Black Leaders

H005801
H004301
H010801

Table F.2 (continued)

Slavery and Civil Rights

H006101
H001601
H006001
H006301
H009201
H003101
H003401
H010601
H007401
H009601
H002701

Civil War & Reconstruction

H011001
H000101
H002601
H005007
H002403
H005101
H006701

Hispanic History

H001001
H007103

Exploration & Early Colonization

H005010
H005901
H000401
H005201
H008201
H008401
H008801
H002201
H004201

Revolutionary War Era

H010201
H000901
H003001
H006801
H009101
H005103
H005401
H006501
H007501
H000201
H011401

Constitution & the New Government

H000501
H001101
H002701
H003501
H005006
H010001
H011201
H002402

Territorial Expansion & Foreign Policy

H001701
H010701
H000601
H001901
H003301
H003801
H005601
H008001
H008101
H007001
H003701
H003901
H004101
H007101
H007102
H007103

World War II

H010301
H009801
H000301
H007701
H008304
H008303
H005004
H008302
H008305
H003601
H001201
H001204
H001205
H001202
H001203
H004701
H002901
H010901

Maps

H000101
H001201
H001202
H001203
H001204
H001205
H004501
H004502
H007101
H007102
H007103
H010001

Table F.2 (continued)

Chronology

H001001
H002101
H002401
H002402
H002403
H002404
H002405
H002406
H002407
H002408
H004001
H005101
H005102
H005103
H005301
H007901
H008301
H008302
H008303
H008304
H008305
H005004
H005005
H005006
H005007
H005008
H005009
H005010
H010401
H010501

Black Literature

L002501
L005201
L007601
L010101
L010901

Biblical Characters & Stories

L000401
L001201
L002101
L002701
L003401
L004201
L005101
L005701
L006501
L008201
L011201
L008801
L009501
L007301
L010301

Shakespeare

L009701
L000601
L000201
L004501
L008401
L003601
L006701

Classical Myths, Legends & Epics

L000701
L001401
L001501
L002901
L003701
L005401
L005901
L006101
L006801
L007701
L008501
L009801
L011101
L011501
L011801
L005801

REFERENCES

EXPANDING THE NEW DESIGN:
THE NAEP 1985-86 TECHNICAL REPORT

References

Applebee, A. N., Langer, J. A., & Mullis, I. V. S. (1987). *Literature & U.S. history: The instructional experience and factual knowledge of high school juniors*. (No. 17-HL-01) Princeton, NJ: National Assessment of Educational Progress.

Applebee, A. N., Langer, J. A., & Mullis, I. V. S. (1988). *Who reads best? Factors related to reading achievement in grades 3, 7, and 11*. (No. 17-R-01) Princeton, NJ: National Assessment of Educational Progress.

Baratz-Snowden, J. C., Rock, D., Pollack, J., & Wilder, G. (1988). *The educational progress of language minority children: Findings from the NAEP 1985-86 special study*. Princeton, NJ: Educational Testing Service.

Barone, J. L., Norris, N. A., & Rogers, A. M. (1986). *NAEP 1983-84 public-use data tapes version 3.1 users' guide.* Princeton, NJ: National Assessment of Educational Progress.

Beaton, A. E. (1988). *The NAEP 1985-86 reading anomaly: A technical report*. (No. 17-TR-10) Princeton, NJ: National Assessment of Educational Progress.

Beaton, A. E. (1987a). *Implementing the new design: The NAEP 1983-84 technical report*. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Beaton, A. E. (1987b). The NAEP reading scale. In A. E. Beaton, *Implementing the new design: The NAEP 1983-84 technical report*. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Beaton, A. E., & Johnson, E. G. (1987). The average response method (ARM) of scaling. In A. E. Beaton, *Implementing the new design: The NAEP 1983-84 technical report*. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Bock, R. D., Gibbons, R. D., and Muraki, E. (1985). *Full-information item factor analysis*. (MRC Report No. 85-1) Chicago: National Opinion Research Center.

Bock, R. D., & Mislevy, R. J. (1981). An item-response model for matrix-sampling data: The California grade 3 assessment. In D. Carlson (Ed.), *Testing in the states: Beyond accountability. New directions in testing and measurement, no. 10*. San Francisco: Jossey-Bass.

Bock, R. D., & Mislevy, R. J. (1988). Comprehensive educational assessment for the states: The duplex design. Educational Evaluation and Policy Analysis, 10(2), 89-105.

Burke, J., Braden, J., Hansen, M., Lago, J., & Tepping, B. (1987). National Assessment of Educational Progress--17th year. Sampling and weighting procedures. Final report. Rockville, MD: Westat, Inc.

Caldwell, N., & Slobasky, R. (1988). Report on field operations and data collection activities, NAEP--year 17 (1985-86). Rockville, MD: Westat, Inc.

Carroll, J. B. (1945). The effect of difficulty and chance success on correlations between items and between tests. Psychometrika, 26, 347-372.

Dossey, J. A., Mullis, I. V. S., Lindquist, M. M., & Chambers, D. L. (1988). The mathematics report card: Are we measuring up? Trends and achievement based on the 1986 National Assessment. (No. 17-M-01) Princeton, NJ: National Assessment of Educational Progress.

Educational Testing Service. (1983). ETS standards for quality and fairness. Princeton, NJ: Author.

Educational Testing Service. (1982). NAEP: A proposal submitted in response to Grant Announcement No. PA-82-001: Technical application. Princeton, NJ: Author.

Ferris, J. J. (1987). Quality control. In A. E. Beaton, Implementing the new design: The NAEP 1983-84 technical report. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Goldstein, H. (1980). Dimensionality, bias, independence and measurement scale problems in latent trait test score models. British Journal of Mathematical and Statistical Psychology, 33, 234-246.

Harman, H. H. (1976). Modern factor analysis. Chicago: The University of Chicago Press.

Holland, P. W., & Thayer, D. T. (1986). Differential item functioning and the Mantel-Haenszel procedure. (ETS Program Statistics Research Technical Report No. 86-69) Princeton, NJ: Educational Testing Service.

Johnson, E. G. (1988). Considerations and techniques for the analysis of NAEP data. (ETS Research Report RR-88-49) Princeton, NJ: Educational Testing Service.

Johnson, E. G. (1987a). Estimation of uncertainty due to sampling variability. In A. E. Beaton, Implementing the new design: The NAEP 1983-84 technical report. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Johnson, E. G. (1987b). Design effects. In A. E. Beaton, Implementing the new design: The NAEP 1983-84 technical report. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Johnson, E. G., & King, B. F. (1987). Generalized variance functions for a complex sample survey. Journal of Official Statistics, 3, 235-250.

Kaplan, B. A., Beaton, A. E., Johnson, E. G., & Johnson, J. R. (1988). National Assessment of Educational Progress 1986 bridge studies. (No. 17-TR-11) Princeton, NJ: National Assessment of Educational Progress.

Kirsch, I. S., & Jungeblut, A. (1986). Literacy: Profiles of America's young adults, final report. (No. 16-PL-01). Princeton, NJ: National Assessment of Educational Progress.

Kish, L. (1965). Survey sampling. New York: John Wiley & Sons.

Kish, L., & Frankel, M. R. (1974). Inference from complex samples. Journal of the Royal Statistical Society, Series B, 36, 1-22.

Lord, F. M. (1980). Applications of item response theory to practical testing problems. Hillsdale, NJ: Lawrence Erlbaum Associates.

Martinez, M. E., & Mead, N. A. (1988). Computer competence: The first National Assessment. (No. 17-CC-01) Princeton, NJ: National Assessment of Educational Progress.

Messick, S. J., Beaton, A. E., & Lord, F. M. (1983). NAEP reconsidered: A new design for a new era. (NAEP Report 83-1) Princeton, NJ: Educational Testing Service.

Messick, S. J. (1984). The psychology of educational measurement. Journal of Educational Measurement, 21, 215-237.

Mislevy, R. J. (1984). Estimating latent distributions. Psychometrika, 49(3), 359-381.

Mislevy, R. J. (1985). Estimation of latent group effects. Journal of the American Statistical Association, 80, 993-997.

Mislevy, R. J. (1988). Randomization-based inferences about latent variables from complex samples. (ETS Research Report RR-88-54-ONR) Princeton, NJ: Educational Testing Service.

Mislevy, R. J., & Bock, R. D. (1982). BILOG: Item analysis and test scoring with binary logistic models [Computer program]. Mooresville, IN: Scientific Software.

Mislevy, R. J., & Sheehan, K. M. (1987). Marginal estimation procedures. In A. E. Beaton, Implementing the new design: The NAEP 1983-84 technical report. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Mislevy, R. J., & Wu, P-K. (1988). Inferring examinee ability when some item responses are missing. (ETS Research Report RR-88-48-ONR) Princeton, NJ: Educational Testing Service.

Mosteller, F., & Tukey, J. W. (1977). Data analysis and regression. Reading, MA: Addison-Wesley.

Mullis, I. V. S., & Jenkins, L. B. (1988). The science report card: Elements of risk and recovery. Trends and achievement based on the 1986 National Assessment. (No. 17-S-01) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1985). The reading report card: Progress toward excellence in our schools. (No. 15-R-01) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1986a). Math objectives, 1985-86 assessment. (No. 17-M-10) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1986b). Science objectives, 1985-86 assessment. (No. 17-S-10) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1986c). A framework for assessing computer competence: Defining objectives. (No. 17-CC-10) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1986d). Foundations of literacy: A description of the assessment of a basic knowledge of United States history and literature. (No. 17-HL-11) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1987a). Reading objectives, 1986 and 1988 assessments. (No. 17/19-R-10) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1987b). Learning by doing: A manual for teaching and assessing higher-order thinking in science and mathematics. (No. 17-HOS-80) Princeton, NJ: National Assessment of Educational Progress.

National Assessment of Educational Progress. (1987c). Pilot study of higher-order skills assessment techniques in science and mathematics. Princeton, NJ: National Assessment of Educational Progress.

Rogers, A. M. (1987). Data entry system. In A. E. Beaton, Implementing the new design: The NAEP 1983-84 technical report. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Rogers, A. M., Kline, D. L., Norris, N. A., Johnson, E. G., Mislevy, R. J., Zwick, R., Barone, J. L., & Kaplan, B. A. (1988). National Assessment of Educational Progress 1985-86 public-use data tapes version 2.0 users' guide. Princeton, NJ: National Assessment of Educational Progress.

Rubin, D. B. (1987). Multiple imputation for nonresponse in surveys. New York: John Wiley & Sons.

Sheehan, K. M. (1985). M-GROUP: Estimation of group effects in multivariate models [Computer program]. Princeton, NJ: Educational Testing Service.

Sheehan, K. M., & Mislevy, R. J. (1988). Some consequences of the uncertainty in IRT linking procedures. (ETS Research Report RR-88-38-ONR) Princeton, NJ: Educational Testing Service.

Stocking, M. L. (1986). TBLT: Transforming b's using a least squares technique [Computer program]. Princeton, NJ: Educational Testing Service.

Stocking, M. L., & Lord, F. M. (1983). Developing a common metric in item response theory. Applied Psychological Measurement, 7, 201-210.

Wilson, D., Wood, R. L., & Gibbons, R. (1983). TESTFACT: Test scoring and item factor analysis [Computer program]. Chicago: Scientific Software.

Zwick, R. (1987a). Assessing the dimensionality of NAEP reading data. Journal of Educational Measurement, 24, 293-308.

Zwick, R. (1987b). Use of the NAEP almanacs. In A. E. Beaton, Implementing the new design: The NAEP 1983-84 technical report. (No. 15-TR-20) Princeton, NJ: National Assessment of Educational Progress.

Zwick, R., & Ercikan, K. (in press). Analysis of differential item functioning in the NAEP history assessment. Journal of Educational Measurement.

9086104 • RT128P.25 • 249550 • Printed in U.S.A.